City of Modesto

UPDATED ENGINEER'S REPORT

DRAFT | November 2021

This document is released for the purpose of information exchange review and planning only under the authority of Ryan M. Sellman, November 15, 2021 California PE, C76650.

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Section 1

INTRODUCTION

In 2016, the Engineer's Report was drafted to provide the basis for establishing wastewater sewer service charges and connection fees to fund the City of Modesto's Wastewater Capital Improvement Program (CIP). The report included project costs, project phasing, and cost development methodologies used to allocate costs to different categories of customers.

This report provides an update to the Engineer's Report and subsequent CIP based on City-identified projects completed as well as updated collection system capacity and treatment needs. It should be noted that the 2016 Engineer's report was completed in January 2016, and the Wastewater Collections and Wastewater Treatment Plant Master Plans were completed in December 2016. This updated engineers report started from the projects shown in the December Master Plans. Projects included in the CIP and discussed in this report are sorted in the following areas:

- Collection system improvements including:
  - Pipeline replacement/addition to provide hydraulic capacity for peak wet weather flows (PWWFs).
  - New sewers or extensions of sewers to serve future customers.
  - Rehabilitation and replacement improvements.
  - Upgrades to improve reliability.
  - Removal of storm drain cross connections.
- Sutter Avenue Primary Treatment Plant (Sutter Plant) projects to improve treatment reliability and increase capacity.
- Outfall pipelines between Sutter and Jennings to improve treatment reliability and increase capacity.
- Jennings Road Secondary/Tertiary Treatment Plant (Jennings Plant) projects to improve reliability and increase capacity.
- Engineering studies including master plan updates, asset management, and miscellaneous compliance planning.

Figure 1 shows the location of the two treatment plants and the routing of the outfall lines between the Sutter Plant and Jennings Plant.

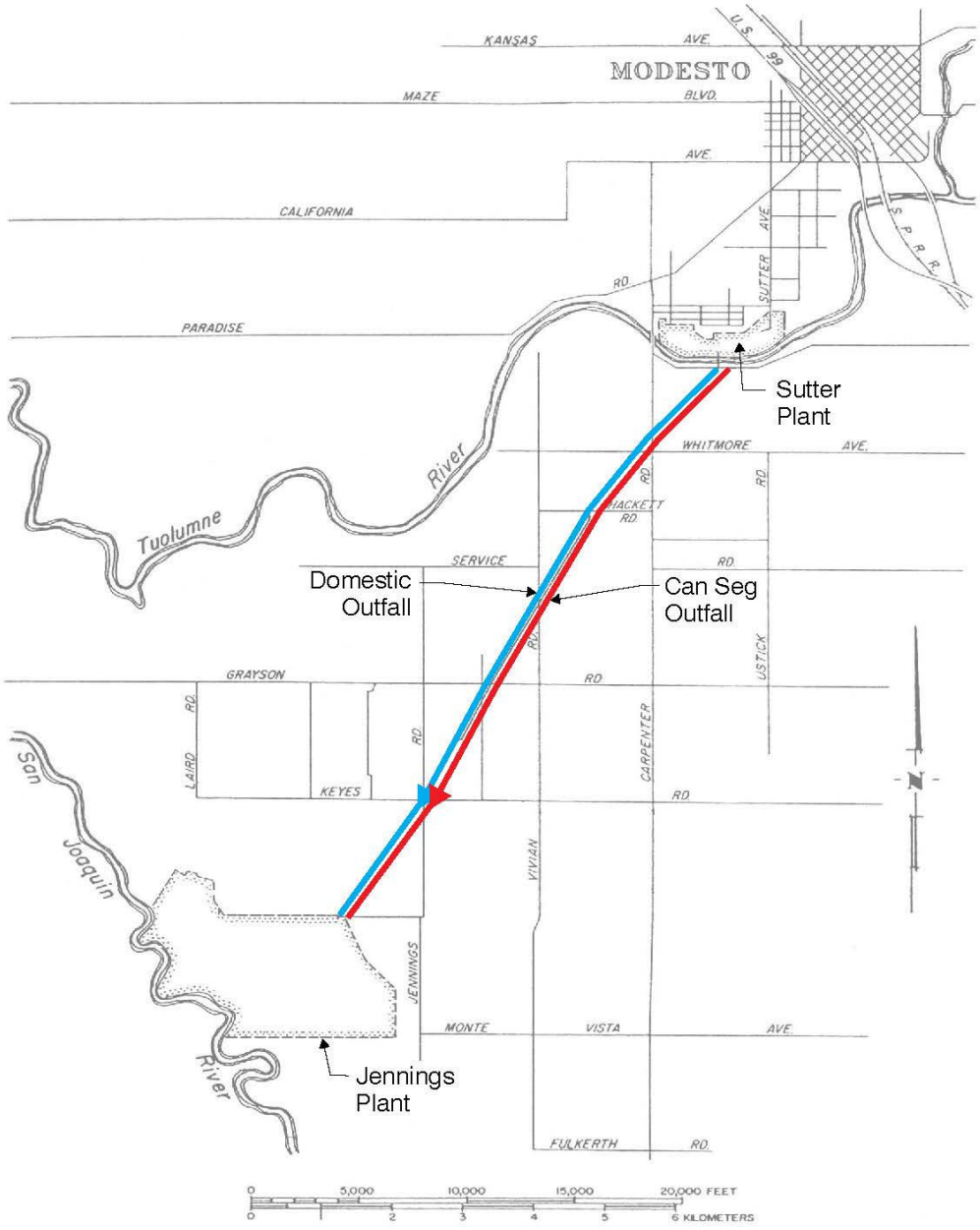


Figure 1 Wastewater Treatment Facilities Site Location

Section 2

PROJECTS COMPLETED SINCE PRIOR ENGINEER'S REPORT

Table 1 below details the projects bid by the City from 2009 through completion of this report. These are projects that the City has completed design, and most are also completely constructed. These projects are all funded by the Wastewater Capital Improvement Program.

Table 1 City of Modesto Bid Projects (2009 to 2021)

Year Bid	Project Title	Total Cost
2009	City of Modesto Water Quality Control Lab Remodel	$670,982.00
2009	2009 Sanitary Lift Station Rehabilitation Project	$447,700.00
2009	Emerald Trunk Line Rehabilitation Project	$5,694,000.00
2009	Ellison Drive Sanitary Pipeline Replacement	$541,718.00
2009	El Rio Sewer Replacement	$963,739.88
2009	2009 Sanitary Sewer Collection System Replacement	$467,430.00
2009	Primary Outfall Rehabilitation Project-Phase1	$3,857,000.00
2009	3200 Nightingale Drive - Building Demolition	$15,750.00
2010	Digester Gas Treatment System Project	$465,000.00
2010	Communications Tower Equipment System Procurement for Jennings Road Wastewater Treatment Facilities	$19,698.11
2010	Ninth Street and L Street Sanitary Sewer Rehabilitation	$42,240.00
2010	Effluent Pump Station Soil Stabilization Project	$321,077.00
2010	Communications Tower Construction for Jennings Road Wastewater Treatment Facilities	$114,208.11
2010	Jennings Wastewater Treatment Plant Potable Water Supply Project	$448,000.00
2011	2010 Sanitary Sewer Collection System Replacement	$1,142,002.00
2011	Dryden Golf Course Sewer Manhole and Service Repair	$27,500.00
2011	Jennings Wastewater Treatment Plant Potable Water Supply Project Water Supply Project	$322,105.00
2011	Phase 2 BNR/Tertiary Treatment Project Preliminary Site Preparation	$922,317.00
2011	Primary Outfall Rehabilitation Project - Phase II	$6,528,000.00
2012	Sanitary Lift Station Lining Rehabilitation	$173,719.00
2012	2012 Sanitary Sewer Collection System Replacement	$691,290.00
2012	Jet-Vac Dump Site Rehabilitation Project	$198,475.00

Year Bid	Project Title	Total Cost
2012	Water Quality Control Facility Office Remodel	$86,814.00
2012	Scenic Sewer Lift Station	$1,575,344.20
2012	Primary Outfall Rehabilitation Project - Phase III	$4,849,000.00
2012	Primary Outfall Rehabilitation Project-Phase III	$2,314,670.00
2012	Phase 2 BNR/Tertiary Wastewater Treatment Project	$100,554,396.91
2013	Jennings Wastewater Treatment Plant Improvements	$889,500.00
2013	Emerald Lift Station Rehabilitation	$2,690,000.00
2013	Area 2 Storm Drain Cross Connection Removal Project - Phase 1 Garrison Park	$3,149,487.00
2013	Emerald Trunk Sewer Relief Project	$5,997,118.50
2014	Shackelford Sewer Crossing	$2,057,561.70
2014	Sutter Treatment Plant Improvements	$1,977,000.00
2015	Cannery Segregation Pump Replacement	$2,594,000.00
2015	2013-14 Sanitary Sewer Collection System Replacement	$1,578,238.00
2016	Cannery Segregation Line Diversion Structure	$1,290,439.00
2016	Santa Rosa Trunk Emergency Repair	$419,797.01
2016	Hahn and Rumble Lift Station Replacements	$2,944,000.00
2016	Mark Randy (LS22) and Torrid/Diablo (LS34) Life Station Improvements	$1,507,000.00
2016	River Trunk Rehabilitation- Gallo Section	$1,591,910.00
2016	Sewer Lift Station Coating	$304,069.00
2016	North Valley Regional Recycled Water Program (NVRRWP)	$40,896,000.00
2017	2015-2016 Sanitary Sewer Collection System	$1,510,138.00
2017	Rumble Sewer Trunk Line Replacement	$2,327,287.00
2017	Tertiary Bypass Line Improvements	$205,000.00
2017	Ceres Trunk Rehabilitation Project	$5,743,485.00
2017	Grayson Replacement Well 274	$408,420.00
2018	Area 2 Storm Water to Sanitary Sewer Cross Connection Removal - Phase 2 Roosevelt Park	$6,124,355.50
2018	Headworks, Dryden Box, and Influent Flume Improvements	$16,972,000.00
2019	Empire Sanitary Sewer Trunk	$3,866,096.00
2019	Crows Landing Sewer Trunk	$3,708,875.00
2020	North Trunk Sewer	$1,797,053.00
2020	2017-2018 Sanitary Sewer	$691,296.00
2020	Jennings Entrance	$3,652,784.90
2021	REBID Sonoma Sanitary Sewer Trunk	$2,022,180.00
2021	River Trunk Realignment - Gravity System	$20,000,000.00

Section 3

FLOW AND LOADS UPDATE

3.1 Domestic Flow and Loads

As part of this Engineer's report update the current flow and loads were reviewed to see how they matched up to the 2016 Engineers Report and the projected flows and loads that were estimated. The 2016 actual flow and loads and the 2020 actual flow and loads were very similar, and had not increased as the 2016 projected flow and loads had indicated. Projects that had not been completed from the 2016 Engineers Report and were being implemented to account for increases in flows and loads were pushed out five years. Figure 2 shows the average and peak flows that were projected in 2016 as well as the actual flows in 2020 and the new projected flows over the Engineers Report. Figure 3 is the same data range but for the biological oxygen demand (BOD) loading to the plant. Since a complete master plan update was not completed, the same projection from 2016 was used in 2020, just updated actual flow and load in 2020.

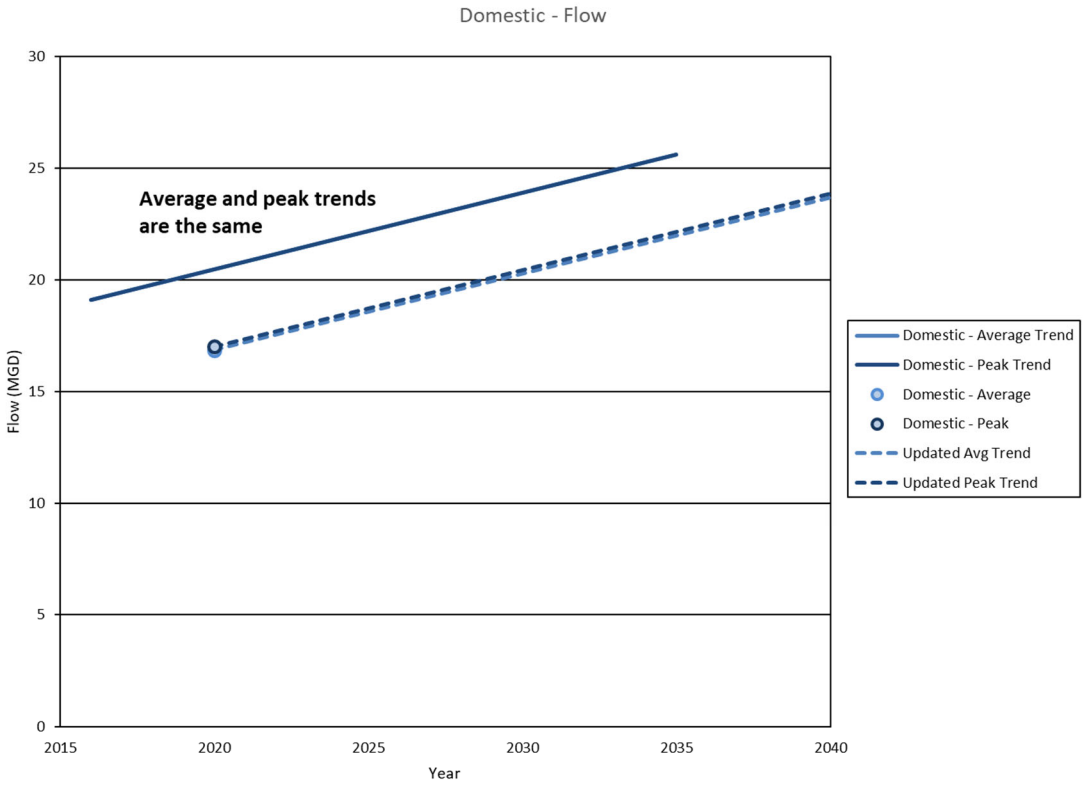


Figure 2 Domestic Flow

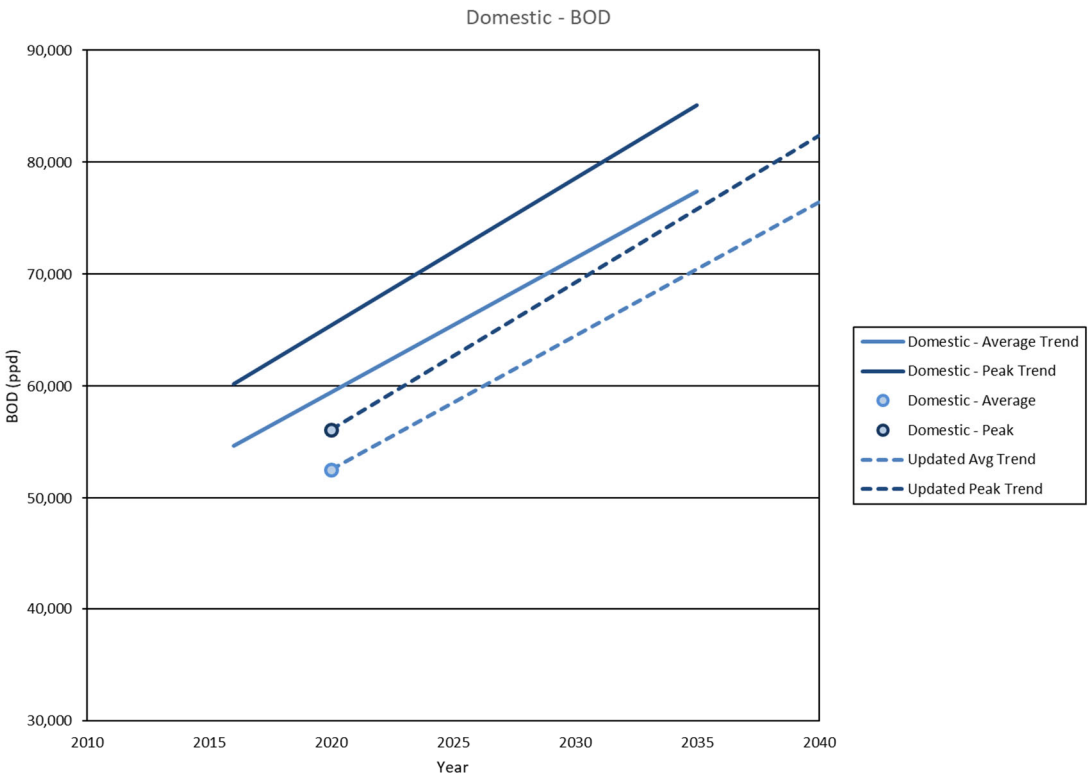


Figure 3 Domestic BOD Loading

3.2 Cannery Segregation Flow and Loads

Similar to the domestic, the cannery segregation flows and loads were checked from 2016-2020 and compared to the projection curves from the 2016 Engineers Report. They were also less than the projected flow and load from the 2016 Engineer's Report, so again all projects that were related to the Cannery Segregation System that were to account for increased flows and loads were pushed out five years. Figure 4 and Figure 5 show the projected flow and loads as well as the actual flow and loads from 2016-2020 and the updated projection trend. Since a full master plan was not completed the same projection curve from 2016 was used for 2020, except the current flow and load data was set to the actual 2020 flow and load.

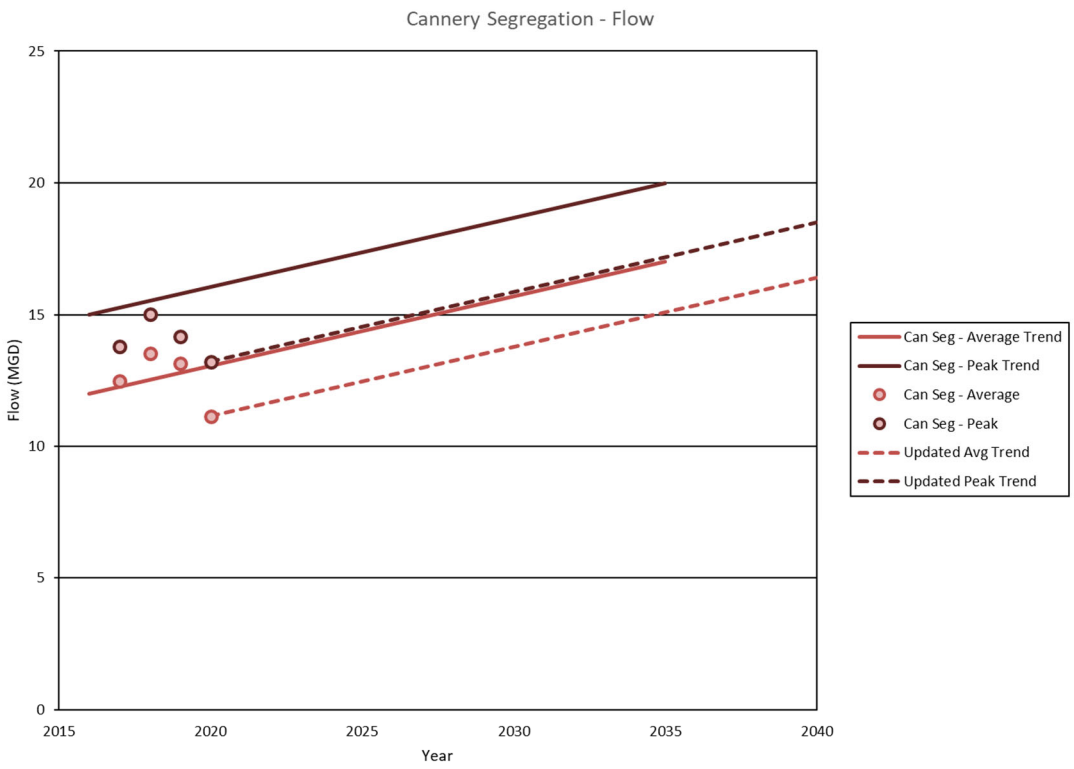


Figure 4 Cannery Segregation Flow

Figure 5 Cannery Segregation BOD Loading

Section 4

SUMMARY OF RECOMMENDED CIP PROJECTS

4.1 Collection System Improvements

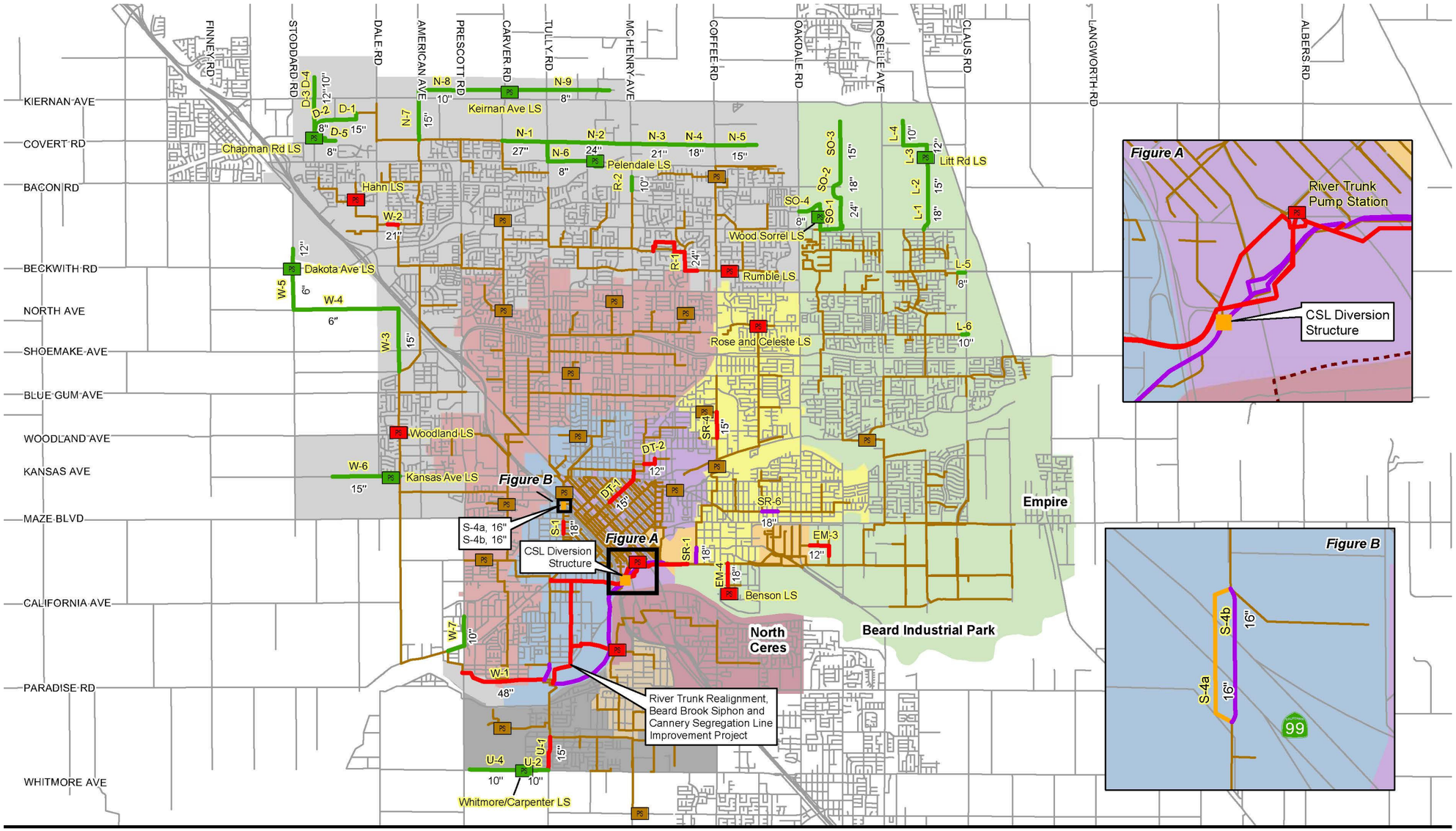
The following sections summarize recommended collection system improvements. Projects are listed by major sewer tributary area, which are shown in Figure 6. Table 2 describes each of the ten sewer service areas:

Table 2 City of Modesto Sewer Tributary Areas

Area No.	Description
1	Located in the City's west and northwest sections. Much of the City's anticipated population growth, and increased wastewater flow will occur in the collection system in this area. The primary trunk lines that convey wastewater from this area to the Sutter Plant are the North Trunk and West Trunk.
2	Located in the City's north-central section. The portion of this area northeast of Highway 99 is nearly built-out. However, the area southwest of Highway 99 will experience some redevelopment, infill development, and potential connections from unincorporated County islands. Currently, Area 2 experiences significant increases in peak wet weather flow (PWWF) because direct storm drain connections to the wastewater collection system cause flow to spike after a storm event. The primary trunk line that conveys flow in this tributary area is the Emerald Trunk.
3	Located in the City's central section. Although this area is primarily built-out, it will experience some redevelopment, infill development, and potential connections from unincorporated County islands. Like Area 2, Area 3 experiences increases in PWWF because of direct storm connections to the wastewater collection system. In this tributary area, the primary trunk that conveys flow is the Sutter Trunk.
4	Encompasses the downtown area of the collection system, likely to experience redevelopment of development intensification, which will increase wastewater flow generated from the area. Like other areas, Area 4 experiences increases in PWWF attributed to the direct storm connections to the wastewater collection system. This area contains several trunks, but the primary trunk lines that convey flow are the J, H, D, 6th, 7th, and 9th Street Trunks.
5	Located immediately east of downtown. The Rose/Celest Lift Station, Rose/Celeste Trunk, and Santa Rosa Trunks serve this area.
6	Located in the City's eastern section, significant population growth anticipated in this area. The Sonoma and Lakewood Trunks serve customers north of the Scenic Lift Station in Area 6. South of the Scenic Lift Station, all wastewater flow is conveyed through the River Trunk. The River Trunk then conveys flow to the Sutter Plant for Areas 4, 5, 6, 7, 8, and 9. The cannery segregation line (CSL) also runs parallel to the River Trunk and serves several large dischargers in the Beard Industrial Park within Area 6.
7	Small industrial area located south of Area 5. The primary trunk servicing this area is the River Trunk.
8	Located in the City's south-central section and includes the north Ceres area served by the Sutter Plant. The Ceres Trunk serves this area and conveys flow to the River Trunk.

Area No.	Description
9	Located in the City's southern section and consists primarily of industrial land uses. This area is served by the Spokane Trunk and could include future flows from adjacent developed areas.
10	Located in the City's southwest section, with future potential residential growth. Land uses include residential, commercial, and industrial. This area is served by the Imperial and South Trunks.

Projects evaluated and described in Table 3 are organized by Existing System Improvements and Future System Improvements and then organized by area. Each project is categorized in the CIP table as either capacity improvements, new growth improvements, rehabilitation and replacement (R&R) improvements, reliability improvements, and storm drain cross connection removal projects. Additional information on project categories and justification is available in the 2016 Engineer's Report (Appendix D). Most projects were just updated from the 2016 Engineer's Report and Master Plans, however, some projects were added by City staff for work that is currently occurring within the City. Projects removed were projects that were completed. Some projects added were from either inspections that occurred by City staff, or from new permits that require updates.



Legend

- Capacity Pump Station Improvements
- Capacity Pipeline Improvements
- New Service Pump Station Improvements
- New Service Pipeline Improvements
- Rehabilitation Pipeline Improvements
- Reliability Pipeline Improvements
- Existing Lift Station
- Existing Pipelines

Tributary Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6
- Area 7
- Area 8/Northern Ceres
- Area 9
- Area 10

Feet: 0 — 4,000 — 8,000

Source: 2016 Engineer's Report

Figure 6 Collection System Improvements

Table 3 CIP Collection and Treatment Project Summary

Project Component	Project Number	Total Project Cost ($)	Phase 1					Phase 2	Phase 3	Phase 4
			2021	2022	2023	2024	2025	2026-2030	2031-2035	2036-2040
			Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)
Collection System Improvements										
Capacity Improvements	-	117,103,767	13,048,500	32,357,340	40,799,519	13,599,840		9,752,567	1,293,000	6,253,000
New Growth Improvements	-	41,541,000		2,978,000			3,000,000	7,533,000	12,218,000	15,812,000
R&R Improvements	-	86,056,701	1,600,000	5,446,216	5,633,024	3,000,000	17,398,648	32,324,605	10,327,104	10,327,104
Reliability Improvements	-	17,440,962	1,500,000	3,250,000	2,250,000			10,440,962		
Storm Drain Removal	-	12,500,000	500,000	3,000,000	500,000	500,000	500,000	2,500,000	2,500,000	2,500,000
Total - Collection System Improvements		**$274,644,000**	**$16,649,000**	**$47,032,000**	**$49,183,000**	**$17,100,000**	**$39,567,000**	**$43,883,000**	**$26,338,000**	**$34,892,000**
Sutter Plant Improvements										
Influent Screw Pump Addition	SP-1	2,562,000							2,562,000	
Influent Screw Pump Replacement	SP-1A	3,400,000		1,700,000		1,700,000				
Outfall Pump Station Replacement	SP-3	20,202,000						20,202,000		
Demolition of Sutter Treatment Facilities	SP-4	5,760,300								5,760,300
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200							2,331,200	
Biosolids Dewatering Facilities	SP-6	18,649,300						18,649,300		
Odor Control Facilities	SP-7	3,150,000		150,000	3,000,000					
Subtotal - Sutter Plant		**56,054,800**		**$1,850,000**	**$3,000,000**	**$1,700,000**		**$38,851,300**	**$4,893,200**	**$5,760,300**
Outfall Pipelines										
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000	200,000					20,612,500	9,745,500	
Third Outfall Pipeline	OP-2	70,726,700							70,726,700	
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400							12,187,400	
Subtotal - Outfall Pipelines		**113,472,100**	**200,000**					**20,612,500**	**92,659,600**	
Jennings Plant Improvements										
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700							5,010,200	49,455,500
Secondary Treatment Facilities Upgrades	JP-2	23,848,200				2,469,200	14,573,800	6,805,200		
Jennings Dewatering & MW Network	JP-7	2,050,000	50,000	2,000,000						
WAS Handling Facilities	JP-4	21,690,100		150,000	1,981,500	9,779,300	9,779,300			
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600						9,149,900	82,348,700	
Membrane Replacement/Optimization Project	JP-8	5,000,000					5,000,000			
Biosolids Removal Project	JP-9	10,000,000		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000		
Corrosion Control Facilities	JP-10	2,200,000	200,000	2,000,000						
River Diversion Facilities	JP-11	2,000,000		2,000,000						
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		250,000						
Solids Removal Equipment	JP-13	1,000,000		1,000,000						
Miscellaneous Repairs	JP-6	1,013,000		250,000	508,700	254,300				
Subtotal - Jennings Plant Improvements		**$215,015,600**	**$250,000**	**$9,650,000**	**$6,959,400**	**$26,607,400**	**$23,584,500**	**$11,149,900**	**$87,358,900**	**$49,455,500**

Project Component	Project Number	Total Project Cost ($)	Phase 1					Phase 2	Phase 3	Phase 4
			2021	2022	2023	2024	2025	2026-2030	2031-2035	2036-2040
			Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)	Total Cost ($)
Engineering Studies										
Master Plan Updates	ES-1	2,150,000	150,000				500,000	500,000	500,000	500,000
WDR Required Studies	ES-3	400,000	200,000	200,000						
CV Salts Compliance	ES-4	360,000	60,000	100,000	200,000					
Asset Management Plan	ES-5	600,000		400,000	200,000					
Biosolids Master Plan	ES-6	350,000			250,000	100,000				
Land Application Study	ES-2	250,000		250,000						
Subtotal - Engineering Studies		**$4,260,000**	**$410,000**	**$1,100,000**	**$650,000**	**$100,000**	**$500,000**	**$500,000**	**$500,000**	**$500,000**
Total - Wastewater Treatment Improvements		**$388,802,500**	**$860,000**	**$12,600,000**	**$10,609,400**	**$28,407,400**	**$24,084,500**	**$71,113,700**	**$185,411,700**	**$55,715,800**
Total - Collection System and Wastewater Treatment		**$663,446,500**	**$17,509,000**	**$59,632,000**	**$59,792,400**	**$45,507,400**	**$63,651,500**	**$114,996,700**	**$211,749,700**	**$90,607,800**

4.1.1 Improvements for Existing System Conditions

Collection system improvements for existing conditions are projects correcting existing system deficiencies. Existing deficiencies occur when the existing facility capacity does not meet the planning criteria. Examples of projects include upgrades to prevent wet weather flow surcharge, rehabilitation of existing pipes with slip lining, or upsizing in lift station or pipeline to accommodate increased wastewater flows. The sections below summarize these identified projects.

4.1.1.1 Area 1

- **West Trunk (Project A-3):** This project is a rehabilitation of a segment of 18-inch RCP piping located on West Roseburg Avenue and extends to Haney Lane. Inspections indicate that roots have penetrated through the RCP piping. The line will be rehabilitated with cured-in-place pipe (CIPP) lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **West Trunk (Project C-1):** This project is a rehabilitation of a segment of 54-inch to 60-inch piping located on Grimes Avenue, Paradise Road, Dunning Lane, Robertson Road, and then through open space extending to the Sutter Treatment Plant. This is from the Woodland Lift Station to the West Trunk Junction Structure. Inspections indicate that pipeline aggregate is missing and protruding. The line will be rehabilitated with slip lining or cured-in-place pipe (CIPP) lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)

4.1.1.2 Area 2

- **Emerald Trunk Tributary (Project B-2):** This project is a rehabilitation of 18-inch to 54-inch RCP piping located in Woodland Avenue. Inspection indicate visible reinforcement with some areas of projecting reinforcement. The line will be rehabilitated with CIPP and/or slip lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **Emerald Trunk Tributary (Project D-2):** This project is a rehabilitation of a segment of 30-inch Corrugated Metal Pipe (CMP) It is a shorter run of 110 feet. It is located at the intersection of W Briggsmore Ave and Tully Road. The CMP has severe degradation and is need or rehabilitation. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **Sutter Trunk (Project S-4a):** The Sutter Trunk crosses Highway 99 as a 16-inch diameter pipeline near Jefferson Street and has a high consequence of failure. This project consists of constructing 400 feet of 16-inch diameter pipeline parallel to the existing sewer.
- **Sutter Trunk (Project S-4b):** This project will consist of rehabilitating 400 feet of the existing Sutter Trunk at the Highway 99 crossing. Prior to implementing this project, a permanent parallel sewer (Project S-4a) will be constructed as a bypass.
- **South Trunk (Project A-2):** This project is a rehabilitation of the south trunk entering the Sutter Treatment Plant including the Siphon under the Tuolumne River, ranging from 24- to 33-inches. Inspections indicate that pipeline has moderate to severe corrosion. The lines will be rehabilitated with CIPP lining. The Sutter trunk within the Sutter plant was abandon-in-place during a previous project and ties into the River

Trunk Junction Structure at the North side of the Sutter Plant. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)

4.1.1.3 Area 3

- **River Trunk, Project 1 (Updated from design documents):**
  - **Dual Force Mains along Floodplain and Tuolumne Blvd:** This project constructs parallel 30-inch and 42-inch outside diameter force mains from the new River Trunk Pump Station. The force mains will run 2,600 feet from the River Trunk Pump station to a discharge structure in Tuolumne Boulevard.
  - **Beard Brook North Gravity Alignment :** This project will replace the existing Beard Brook Siphon with a 48-inch diameter gravity pipeline. The pipeline will run from west of Beard Brook Park to the River Trunk Pump Station over a distance of 3,900 feet. This will eliminate the need for an inverted siphon under Dry Creek and address maintenance and odor issues associated with the siphon.
  - **36-inch and 48-inch Gravity Sewer, B St to Pumping Station:** This project constructs 36-inch and 48-inch gravity sewers that will run from Calaveras Street to the inlet of the River Trunk Pump Station. The sewers will cover a distance of 1,500 feet.
  - **River Trunk Pump Station:** This pump station will allow the River Trunk to be removed from the Tuolumne River bank to mitigate vulnerability to washout. To convey peak wet weather flows (PWWFs), the pump station will require a firm capacity of 54.5 million gallons per day (mgd).
- **River Trunk, Project 2 (Updated from design documents):**
  - **48-inch Gravity Sewer along Tuolumne Blvd:** This project constructs 2,300 feet of 48-inch diameter gravity sewer in Tuolumne Boulevard between Neece Drive and Colorado Avenue. This segment will convey flow from the River Trunk Pump Station force mains to a new 54-inch gravity diameter sewer along Colorado Avenue.
  - **54-inch Gravity Sewer along Colorado Ave:** This project constructs a 4,000-foot gravity sewer with a 54-inch diameter in Colorado Boulevard between Tuolumne Boulevard and Pelton Avenue. Flows from the River Trunk and Sutter Trunk will combine at the intersection of Tuolumne and Colorado and continue south to the Sutter Plant. The pipeline's reach will be over 30 feet deep.
  - **Gravity Sewer along Colorado Ave to Sutter Plant:** This project constructs a gravity sewer with a diameter between 60-inches to 84-inches. The sewer will extend 3,300 feet south along Colorado Avenue and will terminate at the Sutter Plant. Furthermore, it will convey flows from the River Trunk, Sutter Trunk, and Shakelford Pump Station.
- **River Trunk, Project 3 (Updated from design documents):**
  - **14-inch Shackelford Force Main and 18-inch Gravity Sewer:** This project constructs a 14-inch diameter force main that will convey flows from the new Shackelford pump station beneath the Tuolumne River. The new force main will be inserted into a recently completed inverted siphon under Tuolumne River. Beyond the crossing, the force main will continue north through the Dryden Park Golf Course and terminate at an 18-inch diameter gravity pipeline in Roselawn Avenue. Flows will be conveyed to the River Trunk at Colorado and Pelton.

  - **Shackelford Pump Station:** This pump station will pump flows through a new force main under the Tuolumne River and discharge into the River Trunk. To convey PWWFs, the pump station will require a firm capacity of 7.0 mgd.
- **River Trunk (Project RT-10):** Excessive corrosion is present in the entire reach of the Trunk from Beard Brook to the Sutter Plant. Isolated segments that have recently failed or are near failure were also observed. Another segment is severely corroded, with exposed concrete reinforcement bars that possibly indicate another failure.
- **River Bank Armament (Project RT-11):** Due to erosion, some segments of the cannery segregation line (CSL) have lost all soil cover and pipe support. Segments of the River Trunk and CSL that parallel the River have an extremely high consequence of failure and require additional protection along the River Bank.

4.1.1.4 Area 4

- **Downtown Trunk (Project DT-1):** The flow level in the trunk sewer in J Street causes the 12-inch pipeline to surcharge. Therefore, the existing pipeline will be replaced with a 15-inch diameter pipeline that extends approximately 2,400 feet from McHenry Avenue to 12th Street.
- **Downtown Trunk (Project DT-2):** In the existing 10-inch diameter pipelines at Kimble Street and Floto Street, the modeled PWWFs result in a d/D of 0.90, which exceeds the maximum d/D criteria of 0.85. Therefore, these pipelines will be replaced with approximately 1,000 feet of 12-inch diameter pipeline.
- **Downtown Trunk (Project C-3):** This project is a rehabilitation of a segment of 27-inch RCP piping located on 9th Street. Inspections indicate missing and protruding aggregate. The line will be rehabilitated with CIPP lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **Downtown Trunk (Project D-1):** This project is a rehabilitation of a segment of 21-inch to 27-inch RCP piping located on 12th Street and South Morton Blvd. Inspections indicate missing aggregate and missing pipe wall below the flow line. The line will be rehabilitated with CIPP lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **East Morris Area Improvements Phase 1 (Project EM-1):** This project is to rehabilitate existing sewer lines in the East Morris Ave area (north of Scenic Drive). The existing sewer lines range in size from 8-inch to 15-inch. This project is broken into two phases of work. Phase two is Project EM-2 (This project was provided by City staff)
- **East Morris Area Improvements Phase 2 (Project EM-2):** This project is to rehabilitate existing sewer lines in the East Morris Ave area (north of Scenic Drive). The existing sewer lines range in size from 8-inch to 15-inch. This project is broken into two phases of work. Phase one is Project EM-1 (This project was provided by City staff)
- **LaLoma Ave Improvements Phase 1 (Project LL-1):** This project will rehabilitate miscellaneous sewers on or around La Loma Avenue. Phase 1 is the eastern portion of the project. (This project was provided by City staff)
- **LaLoma Ave Improvements Phase 2 (Project LL-2):** This project will rehabilitate miscellaneous sewers on or around La Loma Avenue. Phase 2 is the western portion of the project. (This project was provided by City staff)

4.1.1.5 Area 5

- **Santa Rosa Trunk (Project SR-4):** In the existing 10-inch diameter pipelines at Coffee Road between Fairmont Avenue and Lucern Avenue, the flow level exceeds the maximum d/D criteria under PWWF conditions. This causes the pipeline to surcharge above the crown. Accordingly, the existing pipeline will be replaced with 1,600 feet of 15-inch diameter pipeline.
- **Santa Rosa Trunk (Project SR-6):** This project involves rehabilitating 1,000 feet of 18-inch diameter RCP. The project is located in Miller Avenue, between Conejo Avenue and Phoenix Avenue. This reach is over 50 years old and has significant deterioration.
- **Rose and Celeste Trunk (Project A-1):** This project is a rehabilitation of a segment of 16-inch to 30-inch piping located on Scenic Drive and ends on Oregon Drive. Inspections indicate portions of the pipe in moderate to severe condition. The line will be rehabilitated with CIPP lining. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)
- **Rose and Celeste Lift Station (Project LS #29):** The existing Rose and Celeste Lift Station is located on Rose Avenue and Celeste Drive. This project will increase the firm capacity from 1.44 mgd to 1.5 mgd to accommodate PWWF.

4.1.1.6 Area 6

- **Empire Trunk (Project EM-3):** This project will replace the existing 10-inch diameter pipeline in Hoover Avenue and Doherty Avenue with approximately 1,800 feet of 12-inch diameter pipeline. This improvement is required because the flow levels at PWWF conditions exceed the maximum d/D at approximately 95 percent capacity.
- **Empire Trunk (Project EM-4):** Flow levels in the 15-inch diameter trunk in Benson Avenue between Monterey Avenue and Oregon Drive exceed the d/D criteria under PWWF at approximately 93 percent capacity. Therefore, the existing pipeline will be replaced with 1,400 feet of 18-inch diameter pipeline.
- **Benson Lift Station (Project LS #03):** The existing Benson Lift Station is located on Benson Avenue between Hillside Drive and Trenary Way. This lift station has two pumps, one 150 gpm and one 500 gpm. To provide reliable capacity for current and future PWWFs, this project will increase the firm capacity from 0.22 mgd to 2.6 mgd.
- **Codoni Lift Station (Project LS #16):** The existing Codoni Lift Station is located on Codoni Avenue between Yosemite Boulevard and Leckron Road. The existing lift station is in poor condition and will be replaced with a new lift station. Capacity will be increased from 1.25 to 2.5 mgd. (This project was updated/created by City staff)

4.1.1.7 Area 9

- **River Trunk Tributary (Project B-1):** This project is a rehabilitation of a segment of 30-inch RCP piping located on East Hatch Road. Inspections exposed reinforcement and missing aggregate. The line will be rehabilitated with CIPP lining. A portion of this project was completed earlier when the line had to be re-routed. However the southern 2,800 linear feet (LF) still needs to be rehabilitated. (Wastewater Collection System Condition Assessment Report, February 1, 2016, Brown and Caldwell)

4.1.1.8 City-Wide

- **Storm Drain (SDR) Projects:** Funding reserved to remove storm drain cross connections from the City's sewer collection system and connect into outfalls or larger stormwater collection facilities.
- Rehabilitation and Replacement (R&R) Projects: Funding reserved for miscellaneous R&R projects throughout the sewer collection system. Projects are contingent on future system inspections.

4.1.2 Future Capacity Improvement Projects

Future capacity improvement projects were identified to mitigate future capacity issues due to continued growth throughout the service area. These projects are considered capacity related, not a build-out of the service area. The sections below summarize projects that accommodate future PWWFs within the existing collection system.

4.1.2.1 Area 1

- **West Trunk (Project W-1):** At build-out of Area 1, the increased PWWF from new growth and infill will cause flow levels in the lower reach of the West Trunk to exceed the maximum depth criteria at approximately 90 percent capacity. The deficient pipelines extend 5,300 feet and have diameters ranging from 54-inches to 60-inches. To increase capacity within this reach of the West Trunk, a parallel 48-inch diameter pipeline is recommended. This parallel pipeline will extend 5,200 feet from Carpenter Road to Sutter Plant. This is a long-term project that will depend on growth in Area 1.
- **West Trunk (Project W-3):** One project in a series of improvements to serve future growth in the Beckwith-Dakota and College West development areas. This project consists of 4,000 feet of 15-inch diameter pipeline from North Avenue to McDonald Avenue, where it will connect to the existing West Trunk.
- **West Trunk (Project W-4):** One project in a series of improvements to serve future growth in the Beckwith-Dakota and College West development areas. This project consists of 8,300 feet of 6-inch diameter force main to connect the proposed Dakota Lift Station (LS #64) to Project W-3. The force main will be aligned parallel to Highway 99.
- **West Trunk (Project W-6):** This project will serve future growth within the Highway 132 development area. This project consists of 4,300 feet of 15-inch diameter pipeline that will connect to the existing West Trunk.
- **West Trunk (Project W-7):** This project constructs 2,900 feet of 10-inch diameter pipeline in Carpenter Road and Paradise Road. This will extend the area served by the West Trunk to include existing county islands in the City's southwest section.
- **Kansas Lift Station (LS #63):** This proposed lift station will be located at Kansas Avenue and Altamont Court and serve future growth within the Highway 132 development area. The lift station is necessary due to the minimum slope of the proposed pipelines and surrounding flat topography of the area. The lift station will have a firm capacity of 2.0 mgd.
- **Dakota Lift Station (LS #64):** One project in a series of improvements to serve future growth in the Beckwith-Dakota and College West development areas. This proposed lift station is required due to the invert elevations of the existing downstream collection system and will have a firm capacity of 1.0 mgd.

- **Woodland Lift Station (LS #39):** The existing firm capacity of the Woodland Lift Station, located near the Woodland Avenue and Poust Road intersection, lacks sufficient capacity to convey build-out PWWF. For this reason, firm capacity will be increased from 20.9 mgd to 25.9 mgd and will require replacing the 2,000 gpm and 3,500 gpm pumps with two 4,500 gpm submersible pumps.
- **Rumble Trunk (Project R-1):** Under PWWF conditions, flow depths in the Rumble Trunk from Rumble Road to Maud Kump Terrace exceed the maximum d/D at approximately 89 percent capacity. For this reason, the project will require 5,100 feet of 24-inch diameter pipeline to replace 4,200 feet of existing 21-inch diameter pipeline from Claremont Avenue to Don Caster Lane. A portion of the existing pipeline alignment is in an alley and will be abandoned. The new alignment will require an additional 900 feet of 24-inch diameter pipeline to continue along Barringham Lane and connect to the existing system in Don Caster Lane.
- **Rumble Trunk (Project R-2):** This sewer trunk extension will provide service to future development in the Pelandale/McHenry areas. The project extends the sub-trunk on McHenry Avenue by 900 feet using a 10-inch diameter pipeline from Grecian Avenue that connects to the existing sewer at the intersection of McHenry and Coralwood Road.
- **Dale Trunk and Chapman Road Lift Station (Project D-1):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the Modesto Irrigation District (MID) Lateral 6 Canal. This project consists of 1,200 feet of 15-inch diameter pipeline located in undeveloped land west of Kaiser Permanente. This pipeline extends from the proposed force main and connects to an existing 27-inch diameter pipeline.
- **Dale Trunk (Project D-2):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the MID Lateral 6 Canal. This project consists of 2,600 feet of 6-inch diameter force main. This force main is required to connect the proposed Chapman Road Lift Station (LS #60) to Project D-1.
- **Dale Trunk (Project D-3):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the MID Lateral 6 Canal. This project consists of 1,700 feet of 12-inch pipeline in Chapman Road between Kiernan Avenue and MID Lateral 6 Canal.
- **Dale Trunk (Project D-4):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the MID Lateral 6 Canal. This project consists of 2,200 feet of 10-inch pipeline in Chapman Road from Kiernan Avenue to south of Pirrone Road.
- **Dale Trunk (Project D-5):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the MID Lateral 6 Canal. will be a new gravity sewer that runs parallel to MID Lateral 6 Canal on the north side in an undeveloped area. This pipeline will service an area to the east of the proposed lift station and north of the canal. This reach will consist of 1,500 feet of 8-inch diameter pipeline.
- **Chapman Road Lift Station (LS #60):** One project in a series of improvements to serve future growth within the Kiernan/Carver and Kiernan/Carver North areas, located north of the MID Lateral 6 Canal. A new lift station is necessary due to the area's flat topography and the extensive length and minimum slope of the proposed pipelines. The

lift station will have a firm capacity of 0.8 mgd to convey PWWF from the Kiernan/Carver and Kiernan/Carver North development areas. This lift station is located north of the MID canal.

- **North Trunk (Project N-1):** One project in a series of improvements to serve future growth in the Kiernan/Carver, Kiernan/McHenry, and Hetch Hetchy development areas. This project consists of 2,800 feet of 27-inch diameter pipeline in Bangs Avenue between Tully Road and Carver Road.
- **North Trunk (Project N-2):** One project in a series of improvements to serve future growth in the Kiernan/Carver, Kiernan/McHenry, and Hetch Hetchy development areas. This project consists of 6,100 feet of 24-inch diameter pipeline along Bangs Avenue from McHenry Avenue to Tully Road.
- **North Trunk (Project N-3):** One project in a series of improvements to serve future growth in the Kiernan/Carver, Kiernan/McHenry, and Hetch Hetchy development areas. This project consists of consist of 1,600 feet of 21-inch diameter pipeline. Extending from the MID Lateral 6 Canal to McHenry Road.
- **North Trunk (Project N-4):** One project in a series of improvements to serve future growth in the Kiernan/Carver, Kiernan/McHenry, and Hetch Hetchy development areas. This project consists of 3,100 feet of 18-inch diameter pipeline in undeveloped land from Coffee Road to MID Lateral 6 Canal.
- **North Trunk (Project N-5):** One project in a series of improvements to serve future growth in the Kiernan/Carver, Kiernan/McHenry, and Hetch Hetchy development areas. This project consists of 2,400 feet of 15-inch diameter pipeline in undeveloped land from east of Oakdale Road to Coffee Road.
- **North Trunk (Project N-6):** This project involves adding a lift station and a 10-inch trunk sewer located in Pelandale Avenue and Tully Road. Approximately 3,500 feet of 10-inch sewer has already been installed in Pelandale Avenue. An additional 800 feet in Tully Road is required to connect to Project N-2 along Bangs Avenue. The pump station is discussed as Project LS #59.
- **North Trunk (Project N-7):** One project in a series of improvements to serve future growth in the Kiernan/Carver North development area. This project consists of 3,100 feet of 15-inch diameter pipeline located in American Avenue between Kiernan Avenue and Bangs Avenue.
- **North Trunk (Project N-8):** One project in a series of improvements to serve future growth in the Kiernan/Carver North development area. This project consists of 5,600 feet of 10-inch diameter pipeline north of Kiernan Road from American Avenue to Carver Road.
- **North Trunk (Project N-9):** One project in a series of improvements to serve future growth in the Kiernan/Carver North development area. This project consists of 6,300 feet of 8-inch diameter pipeline on Kiernan Avenue between Carver Road and Stratos Way.
- **Pelandale Lift Station (LS #59):** This improvement will add a lift station because of the area's flat topography and the extensive length and minimum slope of the proposed pipelines. It is discussed with project N-6.
- **Kiernan Lift Station (LS #65):** One project in a series of improvements to serve future growth in the Kiernan/Carver North development area, located at Kiernan Avenue and Carver Road. A new lift station is necessary due to the area's flat topography and the

extensive length and minimum slope of the proposed pipelines. The lift station will have a firm capacity of 0.24 mgd to convey PWWF from the Kiernan/Carver North development area.

4.1.2.2 Area 3

- **Sutter Trunk (Project ST-1):** The trunk in Jefferson Avenue exceeds the d/D criteria when Jefferson LS is abandoned. There is also corrosion concerns. The existing line would be increased to 24-inch in Jefferson Avenue. This would be open cut and is from Hwy 99 to Sutter and Paradise. (This project was updated per City Staff)
- **Sutter Trunk (Project SP-2):** The Sutter trunk from Sutter and Paradise into the Sutter Plant has corrosion and needs to be rehabilitated. This line is proposed to be CIPP. (This project was updated per City Staff)

4.1.2.3 Area 6

- **Sonoma Trunk (SO-2):** One project in a series of improvements to extend the existing Sonoma Trunk to service future growth within the Roselle-Claribel development area. This project consists of approximately 4,000 feet of 24-inch diameter piping on Jeffrey Drive and Sylvan Avenue. (This project was updated per City Staff)
- **Sonoma Trunk (SO-3):** One project in a series of improvements to extend the existing Sonoma Trunk to service future growth within the Roselle-Claribel development area. This project consists of 6,500 feet of 8-inch to 24-inch diameter piping on Oakdale Road, Sylvan Avenue, and Lydia Lane. (This project was updated per City Staff)
- **Sonoma Trunk (SO-4):** One project in a series of improvements to extend the existing Sonoma Trunk to service future growth within the Roselle-Claribel development area. This project consists of 1,900 feet of 18-inch to 24-inch diameter piping. (This project was updated per City Staff)
- **Wood Sorrel Lift Station (LS #61):** This group of improvements is recommended to extend the existing Sonoma Trunk to service future growth within the Roselle-Claribel development area. A new lift station is necessary due to the area's flat topography and the extensive length and minimum slope of the proposed pipelines. The lift station will have a firm capacity of 0.14 mgd. (This project was updated per City Staff)
- **Lakewood Trunk (L-1):** One project in a series of improvements recommended to extend the existing Lakewood trunk to service further growth within the Roselle-Claribel development area. This project consists of 2,900 feet of 18-inch diameter pipeline that connects to the existing 21-inch Lakewood Trunk and is located on Litt Road.
- **Lakewood Trunk (L-2):** One project in a series of improvements recommended to extend the existing Lakewood trunk to service further growth within the Roselle-Claribel development area. This project consists of 1,700 feet of 15-inch diameter pipeline on Litt Road.
- **Lakewood Trunk (L-3):** One project in a series of improvements recommended to extend the existing Lakewood trunk to service further growth within the Roselle-Claribel development area. This project consists of 800 feet of 12-inch diameter pipeline that begins on Plainview road and runs onto Litt Road.
- **Lakewood Trunk (L-4):** One project in a series of improvements recommended to extend the existing Lakewood trunk to service further growth within the Roselle-Claribel development area. This project consists of 3,000 feet of 10-inch diameter that extends south of Claribel Road to Plainview Road.

- **Lakewood Trunk (L-5):** One of two projects that will service business, commercial, and residential growth eastward within the Village One development area. This project consists of 300 feet of 8-inch diameter piping extending into the Falling Leaf Subdivision
- **Lakewood Trunk (L-6):** One of two projects that will service business, commercial, and residential growth eastward within the Village One development area. This project consists of 400 feet of 10-inch diameter piping extending in Merle Avenue for future growth.
- **Litt Road Lift Station (LS #67):** One project in a series of improvements recommended to extend the existing Lakewood trunk to service further growth within the Roselle-Claribel development area. A new lift station is necessary due to the area's flat topography and the extensive length and minimum slope of the proposed pipelines. The lift station will have a firm capacity of 0.64 mgd.

4.1.2.4 Area 10

- **Ustick Trunk (Project U-1):** New growth in the is projected to cause the existing Ustick Trunk to surcharge. This project will replace the 2,100 feet of existing 12-inch diameter piping with 15-inch diameter piping from Whitmore Avenue to Imperial Avenue.
- **Ustick Trunk (Project U-2):** One project in a series of improvements to service commercial and residential growth in the Fairview development area. This project consists of 1,000 feet of 10-inch diameter pipeline in Whitmore Avenue to Ustick Road.
- **Ustick Trunk (Project U-3):** One project in a series of improvements to service commercial and residential growth in the Fairview development area. This project consists of 400 feet of 4-inch diameter force main pipeline to connect with existing pipeline in Ustick Road.
- **Ustick Trunk (Project U-4):** One project in a series of improvements to service commercial and residential growth in the Fairview development area. This project consists of 3,400 feet of 10-inch diameter pipeline on Whitmore Avenue.
- **Whitmore/Carpenter Lift Station (LS #62):** One project in a series of improvements to service commercial and residential growth in the Fairview development area. The lift station will have a firm capacity of 0.4 mgd.

4.2 Wastewater Treatment Plant Improvements

Improvements to the existing wastewater treatment facilities are recommended to improve reliability, provide an increased level of treatment, and to increase treatment capacity to accommodate growth. The recommended projects are categorized as follows:

- **Sutter Plant Improvements:** These improvements expand the Sutter Plant's hydraulic capacity and decommission abandoned facilities.
- **Outfall Pipeline Improvements:** These projects include the construction a third outfall and new river crossings for the Domestic Outfall and Can Seg Outfall. This also includes slip lining to a portion of the Can Seg Outfall.
- **Jennings Plant Improvements:** These projects add new primary treatment and solids handling facilities to the Jennings Plant. As well as upgrades needed to the existing facility. Some of the improvements are required due to new permits.

4.2.1 Sutter Plant Improvements

- **Influent Screw Pump Addition (SP-1):** The existing influent pump station contains four screw pumps. Based on flow projections, a fifth screw-type pump would be required to provide sufficient capacity for projected peak wet weather flow (PWWF) near the end of the 20-year planning period. Space is available for this pump.
- **Influent Screw Pump Replacement (SP-1A):** The existing influent pump station contains four screw pumps that are at the end of their useful life. This project will replace each of the four screw pumps, two at a time. (This project was updated per City Staff.)
- **Outfall Pump Station Replacement (SP-3):** The existing Primary Effluent Pump Station would be replaced with a new Outfall Pump Station located above the 100-year flood elevation. The new pump station would provide the capacity and pumping head required for the projected PWWF and new outfall pipeline.
- **Demolition of Sutter Treatment Facilities (SP-4):** The abandoned facilities at the Sutter Plant would be demolished to below grade and buried to provide space for future facilities or open area. This project will be completed after relocating the Primary Treatment and Solids Handling Facilities to the Jennings Plant (Project JP-5).
- **Allowance for Flood Protection of Remaining Sutter Treatment Facilities (SP-5):** The facilities remaining at the Sutter Plant after the new Primary Treatment and Solids Handling Facilities are constructed at the Jennings Plant would be modified to provide protection against a 100-year flood.
- **Biosolids Dewatering Facilities (SP-6):** This project would reduce the amount of drying beds needed by the City by dewatering the biosolids prior to them going into the drying beds. This could reduce future costs if the City is required to rehabilitate the existing drying beds. This project is driven by the proposed updated permits for the current drying beds. (This project was updated per City Staff.)
- **Odor Control Facilities (SP-7):** Due to Hydrogen Sulfide odor issues at the plant and from the collections system, an odor control facility would be installed to reduce odors and H_2S that are at the Sutter Plant. It was assumed this would be a chemical addition facility. This project is driven by the current odor complaints received at the plant. (This project was updated per City Staff)

4.2.2 Outfall Pipeline Improvements

- **Tuolumne River Pipe Crossings (OP-1):** The existing river crossings for the Primary Domestic Outfall and the Can Seg Outfall are in poor condition due to corrosion. Existing pipe crossings under the Tuolumne River would be replaced with pipes that would allow for increased capacity. In addition, this project would also add a new river crossing for a new Third Domestic Outfall (Project OP-2).
- **Third Outfall Pipeline (OP-2):** A new third outfall from the Sutter Plant to the Jennings Plant would be added to convey domestic flows and provide redundancy for the Can Seg Outfall. It would have a 54-inch diameter and a length of approximately 45,500 feet.
- **Slip Lining Portion of the Can-Seg Outfall (OP-3):** A portion of the Can Seg Outfall would be lined with a plastic liner to improve its condition and reliability. Although the condition of the Can Seg Outfall's interior is unknown, it is assumed that half of the pipeline's length would be lined. However, the actual extent of lining would be defined once the pipeline condition is assessed.

4.2.3 Jennings Plant Improvements

- **Biological Nutrient Removal (BNR)/Tertiary Treatment Facilities Expansion (JP-1):** The tertiary treatment facilities would be expanded to reliably meet anticipated BOD loading limits and to increase tertiary effluent. The tertiary facilities were designed to be expanded in three phases (Phases 3-5). The first of these phases, Phase 3, would be required within the planning period.
- **Secondary Treatment Facilities Upgrades (JP-2):** A series of improvements described as follows:
  - **Fixed Film Reactor (FFR):** The damaged portion of the existing FFR media, rotary distributors, and air supply fans would be replaced to increase the FFRs' performance. The pumps in the FFR Pump Station would also be replaced and equipped with variable frequency drives (VFDs) to meet minimum hydraulic loading requirements. The FFR Effluent Box would be expanded and a new pipe would connect it to the existing pipeline from the Recirculation Diversion Box to the FFR Mixing Box. This modification would allow FFR effluent to recirculate to the FFR influent instead of drawing make-up water from the Recirculation Channel.
  - **Dissolved Air Floatation (DAF) Piping Modifications:** The DAFs remove algae and suspended solids from the pond effluent. The DAF effluent piping would be modified to convey the flow into the Irrigation Forebay, which would then be used to irrigate the Ranch.
- **Waste Activated Sludge (WAS) Handling Facilities (JP-4):** A series of improvements described as follows:
  - **Aerobic Digester:** A 2 MG aerobic digester would stabilize WAS from the Phases 1 and 2 BNR/tertiary treatment processes. Eight 50-hp surface aerators and the associated electrical system would provide mixing and oxygen to the process.
  - **Solids Processing Building:** Two sieve drum concentrators would thicken sludge. One would thicken WAS before aerobic digestion, while the other would thicken digested sludge prior to dewatering. Afterward, a belt filter press, or another process, would dewater the digested sludge before it is sent to the sludge cake drying beds. The WAS thickening and biosolids dewatering equipment would be located in an enclosed building.
  - **Sludge Cake Drying Beds:** Sludge cake, which is dewatered digested sludge, would be solar-dried in new drying beds to reduce its volume and weight and to treat it to Class B standards for land application at the City's ranch. Five acres of drying beds would be required for WAS treatment. The drying beds would consist of an asphalt-paved area with concrete containment walls and piping for drainage and decant return to the existing tailwater pump station (TPS-A). To accommodate additional flows, TPS-A would be rehabilitated as the drying bed facilities are constructed.
- **Primary Treatment and Solids Handling Facilities (JP-5):** A series of improvements described as follows:
  - **Primary Treatment Facilities:** New primary treatment facilities would be built at the Jennings Plant to replace the aging facilities at the Sutter Plant. The new facilities would consist of three 110-foot diameter primary clarifiers, primary sludge pumping, and scum pumping.

  - **Yard Piping and Structures:** Additional yard piping would be added to connect the primary treatment and solids handling facilities to the existing treatment facilities at the Jennings Plant. Flow splitting structures would also be provided.
  - **Anaerobic Digesters:** Three anaerobic digesters would be built at the Jennings Plant to replace the aging digesters at the Sutter Plant and to provide a means for treating WAS generated by the BNR/tertiary facilities. With the addition of the anaerobic digesters, the interim aerobic digester would be decommissioned. Each digester would have a 115-foot diameter and a 31-foot side-water depth, and would treat a combination of WAS and primary sludge from the new primary clarifiers. The digester complex would include a Digester Control Building to house electrical, instrumentation and control, digester mixing, and heating equipment.
  - **Solids Processing Building:** The two existing sieve drum concentrators would thicken WAS before it is sent to the digesters. This is necessary to reduce the volume requirements for the anaerobic digesters. Afterward, four belt filter presses, three new and one existing from the interim WAS handling project, or another process, would dewater the digested sludge before it is sent to the sludge cake drying beds. The WAS thickening and biosolids dewatering equipment would be located in an enclosed building constructed during interim WAS handling project.
- **Miscellaneous Repairs (JP-6):** Allocation for replacement of miscellaneous equipment and upgrades of existing facilities. Areas in need of repairs include the Outfall Flowmeter Pit, FFR Mixing Box, Storage Pump Station, ranch irrigation upgrades, and DAF Facilities.
- **Jennings Dewatering and Monitoring Well (MW) Network (JP-7):** Construction of dewatering wells to allow for facultative ponds dewatering. Water would collect in another facultative pond or collection channel. Additional Ground water monitoring wells would also be installed as part of the CV SALTS program. This project is driven by the current operations of the pond system, and not requiring full pond capacity at this time. The monitoring wells are driven by the CV SALTS program. (This project was updated per City Staff)
- **Membrane Replacement/Optimization Project (JP-8):** This project would expand the capacity of the current Phase 2 project to provide more recycled water capacity. It would be done within the current plant and not part of Phase 3 expansion. This would be completed by adding additional membrane racks in the existing basins and possibly modifying the pumps. (This project was updated per City Staff)
- **Biosolids Removal Project (JP-9):** Solids handling project to remove biosolids from the existing pond system. This includes the recirculation channel, facultative ponds and digestion pits, and irrigation forebay. This project is being proposed due to the current WDR permit that is being considered by the state and biosolids being removed may be a requirement of the new WDR. (This project was updated per City Staff)
- **Corrosion Control Facilities (JP-10):** This project will address the corrosive water that is currently being discharge from the Phase 1 and Phase 2 facility. It will adjust the pH of the effluent to make the water less corrosive. It will also include lining of the UV influent channels and main channels. This project is proposed due to the current effluent quality of the tertiary plants. (This project was updated per City Staff)

- **River Diversion Facilities (JP-11):** This project will add new river diversion facilities to allow the plant to divert water from the San Joaquin River and use it for irrigation of the Ranch to help dilute the cannery segregation water. This project is proposed to acquire more dilution water for the ranch during can-seg season. (This project was updated per City Staff)
- **Ranch Irrigation System Flow Monitoring Modifications (JP-12):** The current flow monitoring system in place does not provide a cohesive picture of flow to the Ranch site. This project would add new flow meters, model the system, or field verification of flow in critical areas, in order to provide waste discharge requirements (WDR) compliance with BOD levels. This project was proposed due to the expected requirements from the new WDR. (This project was updated per City Staff)
- **Solids Removal Equipment (JP-13):** Procurement of a floating excavator or similar equipment to remove solids from the facultative ponds after they have been dewatered. This project was proposed due to the expected requirements from the new WDR. (This project was updated per City Staff)

4.3 Engineering Studies

- **Master Plan Updates (ES-1):** Updates to the City's collection and treatment master plans and subsequent CIP costs. Anticipated to occur approximately every five years.
- **Land Application Study (ES-2):** Study to understand the contribution of contaminants to the groundwater basin via the land applied biosolids from both wastewater treatment plants and the irrigation with secondary effluent and can-seg water. Results of the study will be used to determine if the facilities should be converted into Class A biosolids facilities and if the irrigation practices need to be modified.
- **Waste Discharge Requirements (WDR) Studies (ES-3):** Miscellaneous planning efforts dependent on updates to the City's WDR permits.
- **Central Valley (CV) Salts Compliance (ES-4):** Salinity and nitrate management studies. Level of effort contingent on outcome of ongoing CV Salts program. This project was proposed due to the expected requirements from the new CV SALTS initiative. (This project was updated per City Staff)
- **Asset Management Plan (ES-5):** Development of a comprehensive asset management plan for major City collection system and treatment assets. (This project was updated per City Staff)
- **Biosolids Master Plan (ES-6):** Master Plan to explore options on solids handling and feasibility of the conversion of the Jennings Plant into a Class A biosolids facility. This would evaluate both the pond dredging program and the solids from the Tertiary Facility and the Sutter plant. This project was proposed due to the expected requirements from the new WDR and CV SALTS program and needing to come up with a comprehensive plan to meet future requirements. (This project was updated per City Staff)

Appendix A

COLLECTION AND TREATMENT SYSTEM CAPITAL IMPROVEMENT PROGRAM

Table A.1 Collection and Treatment System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project Component	Project Number	Total Project Cost ($)	Phase 1 2021 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	13,048,500	78.7%	10,271,331	21.3%	2,777,169	0.0%	-
New Growth Improvements		41,541,000	-	0.0%	-	100.0%	-	0.0%	-
R&R Improvements		86,056,701	1,600,000	97.2%	1,555,997	2.8%	44,003	0.0%	-
Reliability Improvements		17,440,962	1,500,000	76.8%	1,152,740	23.2%	347,260	0.0%	-
Storm Drain Removal		12,500,000	500,000	100.0%	500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	16,649,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		56,054,800	-						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000	200,000	35.0%	70,000	7.0%	14,000	58.0%	116,000
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	200,000						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200		74.5%	-	25.5%	-	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000	50,000	16.4%	8,200	5.6%	2,800	78.0%	39,000
WAS Handling Facilities	JP-4	21,690,100		74.5%	-	25.5%	-	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000		74.5%	-	25.5%	-	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000	200,000	74.5%	149,000	25.5%	51,000	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000		16.6%	-	5.8%	-	77.6%	-
Subtotal - Jennings Plant Improvements		215,015,600	250,000						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000	150,000	54.5%	81,750	15.7%	23,550	29.8%	44,700
WDR Required Studies (West Yost to get costs)	ES-3	400,000	200,000	16.4%	32,800	5.6%	11,200	78.0%	156,000
CV Salts Complaince	ES-4	360,000	60,000	85.0%	51,000	0.0%	-	15.0%	9,000
Asset Management Plan	ES-5	600,000		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	350,000		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	410,000						
Total - Wastewater Treatment Improvements		388,652,500	860,000						
Total - Collection System and Wastewater Treatment		663,296,500	17,509,000						

Table A.1 Collection and Treatment System Capital Improvement Program
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Project Component	Project Number	Total Project Cost ($)	Phase 1 2022 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	32,357,340	78.7%	25,470,586	21.3%	6,886,754	0.0%	-
New Growth Improvements		41,541,000	2,978,000	0.0%	-	100.0%	2,978,000	0.0%	-
R&R Improvements		86,056,701	5,446,216	97.2%	5,296,436	2.8%	149,780	0.0%	-
Reliability Improvements		17,440,962	3,250,000	76.8%	2,497,604	23.2%	752,396	0.0%	-
Storm Drain Removal		12,500,000	3,000,000	100.0%	3,000,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	47,032,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000	1,700,000	100.0%	1,700,000	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000	150,000	51.5%	77,250	10.4%	15,600	38.1%	57,150
Subtotal - Sutter Plant		56,054,800	1,850,000						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000		35.0%	-	7.0%	-	58.0%	-
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	-						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200		74.5%	-	25.5%	-	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000	2,000,000	16.4%	328,000	5.6%	112,000	78.0%	1,560,000
WAS Handling Facilities	JP-4	21,690,100	150,000	74.5%	111,750	25.5%	38,250	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
River Diversion Facilities	JP-11	2,000,000	2,000,000	0.0%	-	0.0%	-	100.0%	2,000,000
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000	250,000	0.0%	-	0.0%	-	100.0%	250,000
Solids Removal Equipment	JP-13	1,000,000	1,000,000	74.5%	745,000	25.5%	255,000	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000	250,000	16.6%	41,500	5.8%	14,500	77.6%	194,000
Subtotal - Jennings Plant Improvements		215,015,600	9,650,000						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000		54.5%	-	15.7%	-	29.8%	-
WDR Required Studies (West Yost to get costs)	ES-3	400,000	200,000	16.4%	32,800	5.6%	11,200	78.0%	156,000
CV Salts Complaince	ES-4	360,000	100,000	85.0%	85,000	0.0%	-	15.0%	15,000
Asset Management Plan	ES-5	600,000	400,000	51.5%	206,000	10.4%	41,600	38.1%	152,400
Biosolids Master Plan	ES-6	350,000		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	250,000	250,000	0.0%	-	0.0%	-	100.0%	250,000
Subtotal - Engineering Studies		4,110,000	950,000						
Total - Wastewater Treatment Improvements		388,652,500	12,450,000						
Total - Collection System and Wastewater Treatment		663,296,500	59,482,000						

Table A.1 Collection and Treatment System Capital Improvement Program
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Project Component	Project Number	Total Project Cost ($)	Phase 1 2023 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	40,799,519	78.7%	32,115,979	21.3%	8,683,540	0.0%	-
New Growth Improvements		41,541,000	-	0.0%	-	100.0%	-	0.0%	-
R&R Improvements		86,056,701	5,633,024	97.2%	5,478,107	2.8%	154,917	0.0%	-
Reliability Improvements		17,440,962	2,250,000	76.8%	1,729,111	23.2%	520,889	0.0%	-
Storm Drain Removal		12,500,000	500,000	100.0%	500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	49,183,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000	3,000,000	51.5%	1,545,000	10.4%	312,000	38.1%	1,143,000
Subtotal - Sutter Plant		56,054,800	3,000,000						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000		35.0%	-	7.0%	-	58.0%	-
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	-						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200		74.5%	-	25.5%	-	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	21,690,100	1,981,500	74.5%	1,476,218	25.5%	505,283	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000	508,700	16.6%	84,444	5.8%	29,505	77.6%	394,751
Subtotal - Jennings Plant Improvements		215,015,600	4,490,200						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000		54.5%	-	15.7%	-	29.8%	-
WDR Required Studies (West Yost to get costs)	ES-3	400,000		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	360,000	200,000	85.0%	170,000	0.0%	-	15.0%	30,000
Asset Management Plan	ES-5	600,000	200,000	51.5%	103,000	10.4%	20,800	38.1%	76,200
Biosolids Master Plan	ES-6	350,000	250,000	74.5%	186,250	25.5%	63,750	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	650,000						
Total - Wastewater Treatment Improvements		388,652,500	8,140,200						
Total - Collection System and Wastewater Treatment		663,296,500	57,323,200						

Table A.1 Collection and Treatment System Capital Improvement Program
Engineer's Report
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Project Component	Project Number	Total Project Cost ($)	Phase 1 2024 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	13,599,840	78.7%	10,705,326	21.3%	2,894,513	0.0%	-
New Growth Improvements		41,541,000	-	0.0%	-	100.0%	-	0.0%	-
R&R Improvements		86,056,701	3,000,000	97.2%	2,917,495	2.8%	82,505	0.0%	-
Reliability Improvements		17,440,962	-	76.8%	-	23.2%	-	0.0%	-
Storm Drain Removal		12,500,000	500,000	100.0%	500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	17,100,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000	1,700,000	100.0%	1,700,000	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		56,054,800	1,700,000						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000		35.0%	-	7.0%	-	58.0%	-
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	-						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200	2,469,200	74.5%	1,839,554	25.5%	629,646	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	21,690,100	9,779,300	74.5%	7,285,579	25.5%	2,493,722	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000	254,300	16.6%	42,214	5.8%	14,749	77.6%	197,337
Subtotal - Jennings Plant Improvements		215,015,600	14,502,800						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000		54.5%	-	15.7%	-	29.8%	-
WDR Required Studies (West Yost to get costs)	ES-3	400,000		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	360,000		85.0%	-	0.0%	-	15.0%	-
Asset Management Plan	ES-5	600,000		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	350,000	100,000	74.5%	74,500	25.5%	25,500	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	100,000						
Total - Wastewater Treatment Improvements		388,652,500	16,302,800						
Total - Collection System and Wastewater Treatment		663,296,500	33,402,800						

Table A.1 Collection and Treatment System Capital Improvement Program
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Project Component	Project Number	Total Project Cost ($)	Phase 1 2025 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	-	78.7%	-	21.3%	-	0.0%	-
New Growth Improvements		41,541,000	3,000,000	0.0%	-	100.0%	3,000,000	0.0%	-
R&R Improvements		86,056,701	17,398,648	97.2%	16,920,157	2.8%	478,491	0.0%	-
Reliability Improvements		17,440,962	-	76.8%	-	23.2%	-	0.0%	-
Storm Drain Removal		12,500,000	500,000	100.0%	500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	20,899,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		56,054,800	-						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000		35.0%	-	7.0%	-	58.0%	-
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	-						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200	14,573,800	74.5%	10,857,481	25.5%	3,716,319	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	21,690,100	9,779,300	74.5%	7,285,579	25.5%	2,493,722	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000	5,000,000	74.5%	3,725,000	25.5%	1,275,000	0.0%	-
Biosolids Removal Project	JP-9	10,000,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000		16.6%	-	5.8%	-	77.6%	-
Subtotal - Jennings Plant Improvements		215,015,600	31,353,100						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000	500,000	54.5%	272,500	15.7%	78,500	29.8%	149,000
WDR Required Studies (West Yost to get costs)	ES-3	400,000		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	360,000		85.0%	-	0.0%	-	15.0%	-
Asset Management Plan	ES-5	600,000		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	350,000		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	500,000						
Total - Wastewater Treatment Improvements		388,652,500	31,853,100						
Total - Collection System and Wastewater Treatment		663,296,500	52,752,100						

Table A.1 Collection and Treatment System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project Component	Project Number	Total Project Cost ($)	Phase 2 2026-2030 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	9,752,567	78.7%	7,676,885	21.3%	2,075,681	0.0%	-
New Growth Improvements		41,541,000	7,533,000	0.0%	-	100.0%	7,533,000	0.0%	-
R&R Improvements		86,056,701	32,324,605	97.2%	31,435,625	2.8%	888,980	0.0%	-
Reliability Improvements		17,440,962	10,440,962	76.8%	8,023,812	23.2%	2,417,149	0.0%	-
Storm Drain Removal		12,500,000	2,500,000	100.0%	2,500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	62,551,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000	20,202,000	83.2%	16,808,064	16.8%	3,393,936	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300	18,649,300	74.5%	13,893,729	25.5%	4,755,572	0.0%	-
Odor Control Facilities	SP-7	3,150,000		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		56,054,800	38,851,300						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000	20,612,500	35.0%	7,214,375	7.0%	1,442,875	58.0%	11,955,250
Third Outfall Pipeline	OP-2	70,726,700		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		113,472,100	20,612,500						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700		0.0%	-	100.0%	-	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200	6,805,200	74.5%	5,069,874	25.5%	1,735,326	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	21,690,100	-	74.5%	-	25.5%	-	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600	9,149,900	74.5%	6,816,676	25.5%	2,333,225	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000	2,000,000	74.5%	1,490,000	25.5%	510,000	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000		16.6%	-	5.8%	-	77.6%	-
Subtotal - Jennings Plant Improvements		215,015,600	17,955,100						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000	500,000	54.5%	272,500	15.7%	78,500	29.8%	149,000
WDR Required Studies (West Yost to get costs)	ES-3	400,000		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	360,000		85.0%	-	0.0%	-	15.0%	-
Asset Management Plan	ES-5	600,000		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	350,000		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	500,000						
Total - Wastewater Treatment Improvements		388,652,500	77,918,900						
Total - Collection System and Wastewater Treatment		663,296,500	140,469,900						

Table A.1 Collection and Treatment System Capital Improvement Program
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Project Component	Project Number	Total Project Cost ($)	Phase 3 2031-2035 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		117,103,767	1,293,000	78.7%	1,017,805	21.3%	275,195	0.0%	-
New Growth Improvements		41,541,000	12,218,000	0.0%	-	100.0%	12,218,000	0.0%	-
R&R Improvements		86,056,701	10,327,104	97.2%	10,043,091	2.8%	284,012	0.0%	-
Reliability Improvements		17,440,962	-	76.8%	-	23.2%	-	0.0%	-
Storm Drain Removal		12,500,000	2,500,000	100.0%	2,500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		274,644,000	26,338,000						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,562,000	2,562,000	0.0%	-	100.0%	2,562,000	0.0%	-
Influent Screw Pump Replacement	SP-1A	3,400,000		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	20,202,000		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	5,760,300		74.5%	-	25.5%	-	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,331,200	2,331,200	100.0%	2,331,200	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	18,649,300		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	3,150,000		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		56,054,800	4,893,200						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	30,558,000	9,745,500	35.0%	3,410,925	7.0%	682,185	58.0%	5,652,390
Third Outfall Pipeline	OP-2	70,726,700	70,726,700	66.5%	47,033,256	13.5%	9,548,105	20.0%	14,145,340
Slip Lining Portion of the Can-Seg Outfall	OP-3	12,187,400	12,187,400	0.0%	-	0.0%	-	100.0%	12,187,400
Subtotal - Outfall Pipelines		113,472,100	92,659,600						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	54,465,700	5,010,200	0.0%	-	100.0%	5,010,200	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	23,848,200		74.5%	-	25.5%	-	0.0%	-
Jennings Dewatering & MW Network	JP-7	2,050,000		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	21,690,100		74.5%	-	25.5%	-	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	91,498,600	82,348,700	74.5%	61,349,782	25.5%	20,998,919	0.0%	-
Membrane Replacement/Optimization Project	JP-8	5,000,000		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	10,000,000		74.5%	-	25.5%	-	0.0%	-
Corrosion Control Facilities	JP-10	2,200,000		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	2,000,000		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	250,000		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	1,000,000		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	1,013,000		16.6%	-	5.8%	-	77.6%	-
Subtotal - Jennings Plant Improvements		215,015,600	87,358,900						
Engineering Studies									
Master Plan Updates	ES-1	2,150,000	500,000	54.5%	272,500	15.7%	78,500	29.8%	149,000
WDR Required Studies (West Yost to get costs)	ES-3	400,000		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	360,000		85.0%	-	0.0%	-	15.0%	-
Asset Management Plan	ES-5	600,000		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	350,000		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	250,000		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		4,110,000	500,000						
Total - Wastewater Treatment Improvements		388,652,500	185,411,700						
Total - Collection System and Wastewater Treatment		663,296,500	211,749,700						

Table A.1 Collection and Treatment System Capital Improvement Program
Engineer's Report
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Project Component	Project Number	Total Project Cost ($)	Phase 4 2036-2040 Total Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $
Collection System Improvements									
Capacity Improvements		**117,103,767**	6,253,000	81.4%	5,090,841	18.6%	1,162,159	0.0%	-
New Growth Improvements		**41,541,000**	15,812,000	0.0%	-	100.0%	15,812,000	0.0%	-
R&R Improvements		**86,056,701**	10,327,104	97.2%	10,043,091	2.8%	284,012	0.0%	-
Reliability Improvements		**17,440,962**	-	79.5%	-	20.5%	-	0.0%	-
Storm Drain Removal		**12,500,000**	2,500,000	100.0%	2,500,000	0.0%	-	0.0%	-
Total - Collection System Improvements		**274,644,000**	**34,892,000**						
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	**2,562,000**		0.0%	-	100.0%	-	0.0%	-
Influent Screw Pump Replacement	SP-1A	**3,400,000**		100.0%	-	0.0%	-	0.0%	-
Outfall Pump Station Replacement	SP-3	**20,202,000**		83.2%	-	16.8%	-	0.0%	-
Demolition of Sutter Treatment Facilities	SP-4	**5,760,300**	5,760,300	74.5%	4,291,424	25.5%	1,468,877	0.0%	-
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	**2,331,200**		100.0%	-	0.0%	-	0.0%	-
Biosolids Dewatering Facilities	SP-6	**18,649,300**		74.5%	-	25.5%	-	0.0%	-
Odor Control Facilities	SP-7	**3,150,000**		51.5%	-	10.4%	-	38.1%	-
Subtotal - Sutter Plant		**56,054,800**	**5,760,300**						
Outfall Pipelines									
Tuolumne River Pipe Crossings Subtotal	OP-1	**30,558,000**		35.0%	-	7.0%	-	58.0%	-
Third Outfall Pipeline	OP-2	**70,726,700**		66.5%	-	13.5%	-	20.0%	-
Slip Lining Portion of the Can-Seg Outfall	OP-3	**12,187,400**		0.0%	-	0.0%	-	100.0%	-
Subtotal - Outfall Pipelines		**113,472,100**	-						
Jennings Plant Improvements									
BNR/Tertiary Treatment Facilities Expansion	JP-1	**54,465,700**	49,455,500	0.0%	-	100.0%	49,455,500	0.0%	-
Secondary Treatment Facilities Upgrades	JP-2	**23,848,200**		74.5%	-	25.5%	-	0.0%	-
Jennings Dewatering & MW Network	JP-7	**2,050,000**		16.4%	-	5.6%	-	78.0%	-
WAS Handling Facilities	JP-4	**21,690,100**		74.5%	-	25.5%	-	0.0%	-
Primary Treatment and Solids Handling Facilities	JP-5	**91,498,600**		74.5%	-	25.5%	-	0.0%	-
Membrane Replacement/Optimization Project	JP-8	**5,000,000**		74.5%	-	25.5%	-	0.0%	-
Biosolids Removal Project	JP-9	**10,000,000**		74.5%	-	25.5%	-	0.0%	-
Corrosion Control Facilities	JP-10	**2,200,000**		74.5%	-	25.5%	-	0.0%	-
River Diversion Facilities	JP-11	**2,000,000**		0.0%	-	0.0%	-	100.0%	-
Ranch Irrigation System Flow Monitoring Modifications	JP-12	**250,000**		0.0%	-	0.0%	-	100.0%	-
Solids Removal Equipment	JP-13	**1,000,000**		74.5%	-	25.5%	-	0.0%	-
Miscellaneous Repairs	JP-6	**1,013,000**		16.6%	-	5.8%	-	77.6%	-
Subtotal - Jennings Plant Improvements		**215,015,600**	**49,455,500**						
Engineering Studies									
Master Plan Updates	ES-1	**2,150,000**	500,000	54.5%	272,500	15.7%	78,500	29.8%	149,000
WDR Required Studies (West Yost to get costs)	ES-3	**400,000**		16.4%	-	5.6%	-	78.0%	-
CV Salts Complaince	ES-4	**360,000**		85.0%	-	0.0%	-	15.0%	-
Asset Management Plan	ES-5	**600,000**		51.5%	-	10.4%	-	38.1%	-
Biosolids Master Plan	ES-6	**350,000**		74.5%	-	25.5%	-	0.0%	-
Land Application Study	ES-2	**250,000**		0.0%	-	0.0%	-	100.0%	-
Subtotal - Engineering Studies		**4,110,000**	**500,000**						
Total - Wastewater Treatment Improvements		**388,652,500**	**55,715,800**						
Total - Collection System and Wastewater Treatment		**663,296,500**	**90,607,800**						

Appendix B

COLLECTION SYSTEM CAPITAL IMPROVEMENT PROGRAM

Table B.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1 2021 Project Cost ($)	Phase 1 2022 Project Cost ($)	Phase 1 2023 Project Cost ($)	Phase 1 2024 Project Cost ($)	Phase 1 2025 Project Cost ($)	Phase 2 2026-2030 Project Cost ($)	Phase 3 2031-2035 Project Cost ($)	Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
Existing System Improvements																					
Area 1																					
West Trunk																					
Gravity Pipeline	A-3	Roseburg and Haney Avenue	Inspections along this reach indicate that roots have penetrated the RCP. This pipeline is recommended for urgent repair. The method of rehabilitation will involve cured-in-place (CIPP) lining.	Rehabilitation	18	-	Rehab	3,000		$ 721,499						$ 721,499		0%	$ 721,499	$ 721,000	$ -
Gravity Pipeline	C-1	Woodland Avenue	Pipeline aggregate along this reach is missing and protruding. The method of rehabilitation involves slip-lining.	Rehabilitation	54/60	-	Rehab	24,000		$ 18,668,047						$ 18,668,047		0%	$ 18,668,047	$ 18,668,000	$ -
Area 2																					
Emerald Trunk Tributary																					
Gravity Pipeline	B-2	Mercy Avenue	Inspections along this reach have observed visible reinforcement with some areas of projecting rebar. This method of rehabilitation will involve CIPP lining and slip-lining.	Rehabilitation	18/27/54	-	Rehab	7,500		$ 2,536,318						$ 2,536,318		0%	$ 2,536,318	$ 2,536,000	$ -
Gravity Pipeline	D-2	Briggsmore Avenue and Tully Road	The pipeline coating has deteriorated and is susceptible to corrosion.	Rehabilitation	30	-	Rehab	110		$ 45,458						$ 45,458		0%	$ 45,458	$ 45,458	$ -
Sutter Trunk																					
Gravity Pipeline[4]	S-4a	Highway 99	Increase reliability by constructing a parallel 16-inch diameter trunk under Highway 99.	Reliability	-	16	New	400		$ 2,000,000	$ 1,000,000	$ 1,000,000						0%	$ 2,000,000	$ 2,000,000	$ -
Gravity Pipeline[4]	S-4b	Highway 99	Rehabilitate existing 16-inch diameter trunk.	Rehabilitation	16	-	Rehab	400		$ 1,200,000	$ 600,000	$ 600,000						0%	$ 1,200,000	$ 1,200,000	$ -
Gravity Pipeline	A-2	Pipelines entering Sutter Plant	Pipeline reinforcements within the Sutter reach are corroded, and segments of the wall are missing. PoleCam data on the South Trunk identified pipelines with moderate to severe conditions. The South Trunk Siphon was included in this project for budgeting purposes.	Rehabilitation	24/30	-	Rehab	2,200		$ 846,216		$ 846,216						0%	$ 846,216	$ 846,216	$ -
Area 3																					
River Trunk																					
Gravity Pipeline[3,4]	Project 1	Package of RT-5, -6, -7, and the River Trunk Lift Station	Provides additional conveyance and a new lift station.	Capacity		54.5 mgd 30/36/42/48	New	8,000		$ 67,999,199		$ 13,599,840	$ 40,799,519	$ 13,599,840				41%	$ 67,999,199	$ 40,120,000	$ 27,880,000
Gravity Pipeline[3,4]	Project 2	Package of RT-1, -2, and -3	These improvements will provide gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity			New	9,600		$ 22,497,001	$ 11,248,500	$ 11,248,500						41%	$ 22,497,001	$ 13,273,000	$ 9,224,000
Gravity Pipeline[3,4]	Project 3	Package of RT-8 and the Shakelford Lift Station	These improvements will eliminate the siphone below the Tuolumne River and convey flows from the Shakelford LS to the new River Trunk.	Capacity		4.2 mgd 14/18	New			$ 9,000,000	$ 1,800,000	$ 7,200,000						41%	$ 9,000,000	$ 5,310,000	$ 3,690,000
Gravity Pipeline[3,4]	RT-10	Open Space	Based on the results of the condition assessment, a segment of the River Trunk will require rehabilitation.	Rehabilitation	-	48	New	-		$ 16,398,648				$ 1,000,000	$ 15,398,648			41%	$ 16,398,648	$ 9,681,000	$ 6,718,000
River Bank Armament[3,4]	RT-11	Tuolumne River Bank	Armoring the riverbank to prevent future erosion and expose of the CSL and River Trunk.	Reliability	-	-	New	-		$ 5,440,962						$ 5,440,962		41%	$ 5,440,962	$ 3,212,000	$ 2,229,000
Area 4																					
Downtown Trunks																					
Gravity Pipeline	DT-1	J Street	The trunk in J Street exceeds the maximum d/D criteria under PWWF and causes the existing 12-inch pipeline to surcharge.	Capacity	12	15	Replace	2,400	$ 239	$ 931,000						$ 931,000		4%	$ 931,000	$ 890,000	$ 41,000
Gravity Pipeline	DT-2	Kimble Street and Floto Street	The existing 10-inch diameter pipelines exceed the maximum d/D criteria under PWWF at approximately 90-percent capacity.	Capacity	10	12	Replace	1,000	$ 190	$ 309,000		$ 309,000						4%	$ 309,000	$ 296,000	$ 13,000
Gravity Pipeline	C-3	9th Street	Inspections along this reach have exposed missing aggregate, visible reinforcement and deterioration of the concrete walls. The method of rehabilitation will involve CIPP lining.	Rehabilitation	27	-	Rehab	3,300		$ 1,208,714						$ 1,208,714		4%	$ 1,208,714	$ 1,155,000	$ 53,000
Gravity Pipeline	D-1	12th Street/Morton Boulevard	Aggregate and missing segments of the interior wall were observed below the flow line, which indicates the corrosion is due to chemicals within the wastewater. The method of rehabilitation will involve CIPP lining.	Rehabilitation	21/24/27	-	Rehab	1,800		$ 644,570						$ 644,570		4%	$ 644,570	$ 618,000	$ 27,000
Gravity Pipeline	EM-1	East Morris Phase 1	Miscellaneous sewer replacement in the East Morris area	Rehabilitation						$ 2,000,000			$ 500,000	$ 1,500,000				0%	$ 2,000,000	$ 2,000,000	$ -
Gravity Pipeline	EM-2	East Morris Phase 2	Miscellaneous sewer replacement in the East Morris area	Rehabilitation						$ 4,000,000						$ 4,000,000		0%	$ 4,000,000	$ 4,000,000	$ -
Gravity Pipeline	LL-1	La Loma Phase 1	Rehabilitate around La Loma Ave (Miscellaneous sewers) This is the Western portion of the Project	Rehabilitation						$ 2,500,000		$ 1,000,000	$ 1,500,000					0%	$ 2,500,000	$ 2,500,000	$ -
Gravity Pipeline	LL-2	La Loma Phase 2	Rehabilitate around La Loma Ave (Miscellaneous sewers) This is the Eastern portion of the Project	Rehabilitation						$ 3,500,000					$ 1,500,000	$ 2,000,000		0%	$ 3,500,000	$ 3,500,000	$ -
Area 5																					
Santa Rosa Trunk																					
Gravity Pipeline	SR-4	Coffee Road	The existing 10-inch diameter pipelines in Coffee Road exceed the maximum d/D criteria under PWWF and cause the existing 10-inch pipelines to surcharge.	Capacity	10	15	Replace	1,600	$ 239	$ 621,000						$ 621,000		0%	$ 621,000	$ 621,000	$ -
Gravity Pipeline	SR-6	Kimble Street and Floto Street	This reach is over 50 years old and has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	18	-	Rehab	1,000		$ 358,000			$ 358,000					0%	$ 358,000	$ 358,000	$ -
Rose and Celeste Trunk																					
Gravity/Force Main	A-1	Scenic Drive/Oregon Drive	The project includes rehabilitating gravity pipelines and the 14-inch diameter force main extending from Thousand Oaks Lift Station. Pipeline conditions range from severe to moderate. Urgent repairs are recommended where a void and corroded reinforcements have been observed. The method of rehabilitation will involve CIPP lining.	Rehabilitation	16/18/24/30	-	Rehab	8,800		$ 2,631,000		$ 1,000,000	$ 1,631,000					0%	$ 2,631,000	$ 2,631,000	$ -
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste	Rose Avenue and Celeste Drive	Increase the firm capacity from 0.86 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	1.4 mgd	1.3 mgd	N/A	-	$ -	$ 2,087,567						$ 2,087,567		0%	$ 2,087,567	$ 2,087,567	$ -
Area 6																					
Empire Trunk																					
Gravity Pipeline	EM-3	Hoover Avenue	The existing pipelines exceed the maximum d/D under PWWF at approximately 95-percent capacity.	Capacity	10	12	Replace	1,800	$ 190	$ 556,000						$ 556,000		14%	$ 556,000	$ 478,000	$ 78,000
Gravity Pipeline	EM-4	Benson Avenue	The 15-inch diameter trunk in Benson Avenue exceeds the d/D criteria under PWWF at approximately 93 percent capacity.	Capacity	15	18	Replace	1,400	$ 260	$ 592,000						$ 592,000		3%	$ 592,000	$ 573,000	$ 19,000
Benson Lift Station	LS # 03 - Benson	Benson Avenue	Increase the firm capacity from 0.22 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.22	2.6	Replace	-	$ 1,284,477	$ 2,087,000						$ 2,087,000		0%	$ 2,087,000	$ 2,080,000	$ 7,000
Codoni Lift Station	LS #16	Codoni Ave	The existing lift station is in poor condition, and will be replaced with a new lift station.	Rehabilitation	1.25 mgd	2.5 mgd	Replace	-	-	$ 2,000,000	$ 500,000	$ 1,500,000						0%	$ 2,000,000	$ 2,000,000	$ -
Area 9																					
River Trunk Tributary																					
Gravity Pipeline	B-1	Spokane Street/Cascade Avenue	Inspections along this reach have observed missing aggregate and visible reinforcement. This method of rehabilitation will involve CIPP lining.	Rehabilitation	30	-	Rehab	2,799	$ -	$ 1,144,024			$ 1,144,024					0%	$ 1,144,024	$ 1,144,024	$ -
City-wide																					
Storm Drain	SDR	Various Locations	Remove storm drain connections from the sewer collection system.	Storm Drain Removal	-	-	-	-		$ 12,500,000	$ 500,000	$ 3,000,000	$ 500,000	$ 500,000	$ 500,000	$ 2,500,000	$ 2,500,000	0%	$ 12,500,000	$ 12,500,000	$ -
Rehabilitation & Replacement	R&R	Various Locations	Small and Large Diameter Rehabilitation and Replacement Program.	Rehabilitation	-	-	-	-		$ 25,654,207	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 2,500,000	$ 10,327,104	0%	$ 25,654,207	$ 25,654,207	$ -
Existing Improvements Cost Estimate										212,677,429	16,148,500	41,803,557	46,932,543	17,099,840	17,898,648	47,140,134	12,827,104		212,677,000	162,698,000	49,979,000

Table B.1 Collection System Capital Improvement Program
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Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1 2021 Project Cost ($)	Phase 1 2022 Project Cost ($)	Phase 1 2023 Project Cost ($)	Phase 1 2024 Project Cost ($)	Phase 1 2025 Project Cost ($)	Phase 2 2026-2030 Project Cost ($)	Phase 3 2031-2035 Project Cost ($)	Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
Future System Improvements																					
Area 1																					
West Trunk																					
Gravity Pipeline	W-1	Carpenter Road to Sutter Plant	Build-out PWWF causes the lower reach of the West Trunk to exceed the maximum depth criteria at approximately 90 percent capacity.	Capacity	-	48	New	5,200	$ 643	$ 5,437,000								34%	$ 5,437,000	$ 3,578,000	$ 1,859,000
Gravity Pipeline	W-3	Undeveloped Area	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	15	New	4,000	$ 239	$ 1,554,000								100%	$ 1,554,000	$ -	$ 1,554,000
Force Main	W-4	North Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	6	New	9,000	$ 171	$ 2,506,000								100%	$ 2,506,000	$ -	$ 2,506,000
Gravity Pipeline	W-6	Kansas Avenue	This improvement is recommended to service future growth within the Highway 132 CPD.	New Growth	-	15	New	4,300	$ 239	$ 1,669,000								100%	$ 1,669,000	$ -	$ 1,669,000
Gravity Pipeline	W-7	Carpenter Road and Paradise Road	This improvement is recommended to service infill as the sewer service area extends to include county islands.	New Growth	-	12	New	2,900	$ 190	$ 895,000							$ 895,000	100%	$ 895,000	$ -	$ 895,000
Kansas Lift Station	LS # 63	Kansas Avenue and Altamont Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	2.0 mgd	New	-	$ 1,059,519	$ 1,723,000								100%	$ 1,723,000	$ -	$ 1,723,000
Dakota Lift Station	LS # 64	Dakota Road and Beckwith Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.0 mgd	New	-	$ 705,180	$ 1,146,000								100%	$ 1,146,000	$ -	$ 1,146,000
Woodland Lift Station[5]	LS # 39	Woodland Avenue and Poust Road	It is proposed that the firm capacity be increased to 25.2 mgd from its current capacity of 20.9 mgd to meet future PWWFs.	Capacity	27.4 mgd	32.4 mgd	Expand	-	-	$ 1,293,000							$ 1,293,000	39%	$ 1,293,000	$ 790,000	$ 503,000
Rumble Trunk																					
Gravity Pipeline	R-1	Claremont Avenue and Maud Kump Terrace	Under PWWF conditions, this reach of the Rumble Trunk experiences flow depths in excess of the maximum d/D at approximately 90-percent capacity.	Capacity	21	24	Replace	5,100	$ 347	$ 2,878,000						$ 2,878,000		19%	$ 2,878,000	$ 2,322,000	$ 556,000
Gravity Pipeline	R-2	McHenry Avenue	This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD.	New Growth	-	10	New	900	$ 160	$ 234,000						$ 234,000		100%	$ 234,000	$ -	$ 234,000
Dale Trunk																					
Gravity Pipeline	D-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	15	New	1,200	$ 239	$ 466,000							$ 466,000	100%	$ 466,000	$ -	$ 466,000
Force Main	D-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	6	New	2,600	$ 171	$ 723,000							$ 723,000	100%	$ 723,000	$ -	$ 723,000
Gravity Pipeline	D-3	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	12	New	1,700	$ 190	$ 525,000							$ 525,000	100%	$ 525,000	$ -	$ 525,000
Gravity Pipeline	D-4	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	10	New	2,200	$ 160	$ 570,000							$ 570,000	100%	$ 570,000	$ -	$ 570,000
Gravity Pipeline	D-5	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	8	New	1,500	$ 127	$ 310,000							$ 310,000	100%	$ 310,000	$ -	$ 310,000
Chapman Lift Station	LS # 60	Chapman Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.6 mgd	New	-	$ 914,986	$ 1,487,000							$ 1,487,000	100%	$ 1,487,000	$ -	$ 1,487,000
North Trunk Extension																					
Gravity Pipeline	N-1	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	27	New	2,800	$ 390	$ 1,776,000						$ 1,776,000		100%	$ 1,776,000	$ -	$ 1,776,000
Gravity Pipeline	N-2	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	24	New	6,100	$ 347	$ 3,443,000						$ 3,443,000		100%	$ 3,443,000	$ -	$ 3,443,000
Gravity Pipeline	N-3	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	21	New	1,600	$ 303	$ 788,000							$ 788,000	100%	$ 788,000	$ -	$ 788,000
Gravity Pipeline	N-4	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	18	New	3,100	$ 260	$ 1,310,000							$ 1,310,000	100%	$ 1,310,000	$ -	$ 1,310,000
Gravity Pipeline	N-5	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	2,400	$ 239	$ 931,000							$ 931,000	100%	$ 931,000	$ -	$ 931,000
Gravity Pipeline	N-6	Tully Road and Pelandale Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	4,800	$ 160	$ 179,000						$ 179,000		100%	$ 179,000	$ -	$ 179,000
Gravity Pipeline	N-7	American Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	3,100	$ 239	$ 1,204,000								100%	$ 1,204,000	$ -	$ 1,204,000
Gravity Pipeline	N-8	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	5,600	$ 160	$ 1,453,000								100%	$ 1,453,000	$ -	$ 1,453,000
Gravity Pipeline	N-9	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	8	New	6,300	$ 127	$ 1,300,000								100%	$ 1,300,000	$ -	$ 1,300,000
Pelandale Lift Station	LS # 59	Pelandale Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.28	New	-	$ 462,738	$ 752,000						$ 752,000		100%	$ 752,000	$ -	$ 752,000
Kiernan Lift Station	LS # 65	Kiernan Avenue and Carver Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.48	New	-	$ 529,177	$ 860,000								100%	$ 860,000	$ -	$ 860,000
Area 3																					
Sutter Trunk																					
Gravity Pipeline	ST-1	Jefferson Street and Paradise Road	The trunk in Jefferson Avenue exceeds the d/D criteria when Jefferson LS is abandoned. There is also corrosion concerns.	Reliability	16	24	Replace			$ 5,000,000	$ 500,000	$ 2,250,000	$ 2,250,000					26%	$ 5,000,000	$ 3,718,000	$ 1,282,000
Gravity Pipeline	ST-2	Sutter Avenue	The trunk in Jefferson Avenue exceeds the d/D criteria when Jefferson LS is abandoned. There is also corrosion concerns.	Reliability	18	24	Replace			$ 5,000,000						$ 5,000,000		26%	$ 5,000,000	$ 3,700,000	$ 1,300,000
Area 6																					
Sonoma Trunk Extension																					
Gravity Pipeline	SO-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-		New			$ 2,300,000		$ 2,300,000						100%	$ 2,300,000	$ -	$ 2,300,000
Gravity Pipeline	SO-3	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	18	New	2,800	$ 260	$ 3,000,000					$ 3,000,000			100%	$ 3,000,000	$ -	$ 3,000,000
Gravity Pipeline	SO-4	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	15	New	2,800	$ 239	$ 1,087,000						$ 1,087,000		100%	$ 1,087,000	$ -	$ 1,087,000
Wood Sorrel Lift Station	LS # 61	North of Wood Sorrel Drive and Sylvan Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.14	New	-	$ 417,280	$ 678,000		$ 678,000						100%	$ 678,000	$ -	$ 678,000
Lakewood Trunk Extension																					
Gravity Pipeline	L-1	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	18	New	2,900	$ 260	$ 1,225,000							$ 1,225,000	100%	$ 1,225,000	$ -	$ 1,225,000
Gravity Pipeline	L-2	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	15	New	1,700	$ 239	$ 660,000							$ 660,000	100%	$ 660,000	$ -	$ 660,000
Gravity Pipeline	L-3	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	12	New	800	$ 190	$ 247,000							$ 247,000	100%	$ 247,000	$ -	$ 247,000
Gravity Pipeline	L-4	Plainview Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	3,000	$ 160	$ 778,000							$ 778,000	100%	$ 778,000	$ -	$ 778,000
Gravity Pipeline	L-5	Claus Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	8	New	300	$ 127	$ 62,000						$ 62,000		100%	$ 62,000	$ -	$ 62,000
Gravity Pipeline	L-6	Merle Ave	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	400	$ 160	$ 104,000							$ 104,000	100%	$ 104,000	$ -	$ 104,000
Litt Lift Station	LS # 67	Litt Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.28	New	-	$ 801,924	$ 1,303,000							$ 1,303,000	100%	$ 1,303,000	$ -	$ 1,303,000

Table B.1 Collection System Capital Improvement Program
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Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1					Phase 2	Phase 3	Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
											2021	2022	2023	2024	2025	2026-2030	2031-2035				
											Project Cost ($)	Project Cost ($)	Project Cost ($)	Project Cost ($)	Project Cost ($)	Project Cost ($)	Project Cost ($)				
Area 10																					
Ustick Trunk																					
Gravity Pipeline	U-1	Ustick Road	At build-out of Area 10, the PWWF from new growth will cause the Ustick Trunk to surcharge.	Capacity	12	15	Replace	2,100	$ 239	$ 816,000								56%	$ 816,007	$ 356,000	$ 460,000
Gravity Pipeline	U-2	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	1,000	$ 160	$ 260,000								100%	$ 260,000	$ -	$ 260,000
Force Main	U-3	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	4	New	427	$ 168	$ 117,000								100%	$ 117,007	$ -	$ 117,007
Gravity Pipeline	U-4	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	3,400	$ 160	$ 882,000								100%	$ 882,000	$ -	$ 882,000
Whitmore/Carpenter Lift Station	LS # 62	Whitmore Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.8	New	-	$ 636,411	$ 1,034,000								100%	$ 1,034,007	$ -	$ 1,034,007
Future Improvements Cost Estimate										61,965,000	500,000	5,228,000	2,250,000		3,000,000	15,411,000	13,511,000		61,965,000	14,464,000	47,501,000
Total Capital Improvement Cost Estimate										274,642,429	16,648,500	47,031,557	49,182,543	17,099,840	20,898,648	62,551,134	26,338,104		274,642,000	177,162,000	97,480,000

Notes:
1. Costs are provided as present value based on an ENR CCI number of 11699 corresponding to the 20-City Average Index in February 2021. Costs are not escalated to future years.
2. Total construction cost includes the baseline construction cost plus a 25 percent allowance to account for unforeseen events and unknown conditions. Total project cost includes a 30 percent allowance to cover other costs including engineering, construction management, and project administration.
3. Cost estimates are from the River Trunk Realignment, Beard Brook Siphon and Cannery Segregation Line Improvement Project PDR.
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the 2007 Master Plan and was escalated to reflect the most probable current cost.
6. Lift station capacities refer to the total capacity unless noted otherwise.

Appendix C

COLLECTION SYSTEM CAPITAL IMPROVEMENT

Table C.1 Collection System Capital Improvement Program
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Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)
Existing System Improvements										
Area 1										
West Trunk										
Gravity Pipeline	A-3	Roseburg and Haney Avenue	Inspections along this reach indicate that roots have penetrated the RCP. This pipeline is recommended for urgent repair. The method of rehabilitation will involve cured-in-place (CIPP) lining.	Rehabilitation	18	-	Rehab	3,000		$ 721,499
Gravity Pipeline	C-1	Woodland Avenue	Pipeline aggregate along this reach is missing and protruding. The method of rehabilitation involves slip-lining.	Rehabilitation	54/60	-	Rehab	24,000		$ 18,668,047
Area 2										
Emerald Trunk Tributary										
Gravity Pipeline	B-2	Mercy Avenue	Inspections along this reach have observed visible reinforcement with some areas of projecting rebar. This method of rehabilitation will involve CIPP lining and slip-lining.	Rehabilitation	18/27/54	-	Rehab	7,500		$ 2,536,318
Gravity Pipeline	D-2	Briggsmore Avenue and Tully Road	The pipeline coating has deteriorated and is susceptible to corrosion.	Rehabilitation	30	-	Rehab	110		$ 45,458
Sutter Trunk										
Gravity Pipeline[4]	S-4a	Highway 99	Increase reliability by constructing a parallel 16-inch diameter trunk under Highway 99.	Reliability	-	16	New	400		$ 2,000,000
Gravity Pipeline[4]	S-4b	Highway 99	Rehabilitate existing 16-inch diameter trunk.	Rehabilitation	16	-	Rehab	400		$ 1,200,000
Gravity Pipeline	A-2	Pipelines entering Sutter Plant	Pipeline reinforcements within the Sutter reach are corroded, and segments of the wall are missing. PoleCam data on the South Trunk identified pipelines with moderate to severe conditions. The South Trunk Siphon was included in this project for budgeting purposes.	Rehabilitation	24/30	-	Rehab	2,200		$ 846,216
Area 3										
River Trunk										
Gravity Pipeline[3,4]	Project 1	Package of RT-5, -6, -7, and the River Trunk Lift Station	Provides additional conveyance and a new lift station.	Capacity		54.5 mgd 30/36/42/48	New	8,000		$ 67,999,199
Gravity Pipeline[3,4]	Project 2	Package of RT-1, -2, and -3	These improvements will provide gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity			New	9,600		$ 22,497,001
Gravity Pipeline[3,4]	Project 3	Package of RT-8 and the Shakelford Lift Station	These improvements will eliminate the siphone below the Tuolumne River and convey flows from the Shakelford LS to the new River Trunk.	Capacity		4.2 mgd 14/18	New			$ 9,000,000
Gravity Pipeline[3,4]	RT-10	Open Space	Based on the results of the condition assessment, a segment of the River Trunk will require rehabilitation.	Rehabilitation	-	48	New	-		$ 16,398,648
River Bank Armament[3,4]	RT-11	Tuolumne River Bank	Armoring the riverbank to prevent future erosion and expose of the CSL and River Trunk.	Reliability	-	-	New	-		$ 5,440,962
Area 4										
Downtown Trunks										
Gravity Pipeline	DT-1	J Street	The trunk in J Street exceeds the maximum d/D criteria under PWWF and causes the existing 12-inch pipeline to surcharge.	Capacity	12	15	Replace	2,400	$ 239	$ 931,000
Gravity Pipeline	DT-2	Kimble Street and Floto Street	The existing 10-inch diameter pipelines exceed the maximum d/D criteria under PWWF at approximately 90-percent capacity.	Capacity	10	12	Replace	1,000	$ 190	$ 309,000
Gravity Pipeline	C-3	9th Street	Inspections along this reach have exposed missing aggregate, visible reinforcement and deterioration of the concrete walls. The method of rehabilitation will involve CIPP lining.	Rehabilitation	27	-	Rehab	3,300		$ 1,208,714
Gravity Pipeline	D-1	12th Street/Morton Boulevard	Aggregate and missing segments of the interior wall were observed below the flow line, which indicates the corrosion is due to chemicals within the wastewater. The method of rehabilitation will involve CIPP lining.	Rehabilitation	21/24/27	-	Rehab	1,800		$ 644,570
Gravity Pipeline	EM-1	East Morris Phase 1	Miscellaneous sewer replacement in the East Morris area	Rehabilitation						$ 2,000,000
Gravity Pipeline	EM-2	East Morris Phase 2	Miscellaneous sewer replacement in the East Morris area	Rehabilitation						$ 4,000,000
Gravity Pipeline	LL-1	La Loma Phase 1	Rehabilitate around La Loma Ave (Miscellaneous sewers) This is the Western portion of the Project	Rehabilitation						$ 2,500,000
Gravity Pipeline	LL-2	La Loma Phase 2	Rehabilitate around La Loma Ave (Miscellaneous sewers) This is the Eastern portion of the Project	Rehabilitation						$ 3,500,000

Table C.1 Collection System Capital Improvement Program
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Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)
Area 5										
Santa Rosa Trunk										
Gravity Pipeline	SR-4	Coffee Road	The existing 10-inch diameter pipelines in Coffee Road exceed the maximum d/D criteria under PWWF and cause the existing 10-inch pipelines to surcharge.	Capacity	10	15	Replace	1,600	$ 239	$ 621,000
Gravity Pipeline	SR-6	Kimble Street and Floto Street	This reach is over 50 years old and has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	18	-	Rehab	1,000		$ 358,000
Rose and Celeste Trunk										
Gravity/Force Main	A-1	Scenic Drive/Oregon Drive	The project includes rehabilitating gravity pipelines and the 14-inch diameter force main extending from Thousand Oaks Lift Station. Pipeline conditions range from severe to moderate. Urgent repairs are recommended where a void and corroded reinforcements have been observed. The method of rehabilitation will involve CIPP lining.	Rehabilitation	16/18/24/30	-	Rehab	8,800		$ 2,631,000
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste	Rose Avenue and Celeste Drive	Increase the firm capacity from 0.86 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	1.4 mgd	1.3 mgd	N/A	-	$ -	$ 2,087,567
Area 6										
Empire Trunk										
Gravity Pipeline	EM-3	Hoover Avenue	The existing pipelines exceed the maximum d/D under PWWF at approximately 95-percent capacity.	Capacity	10	12	Replace	1,800	$ 190	$ 556,000
Gravity Pipeline	EM-4	Benson Avenue	The 15-inch diameter trunk in Benson Avenue exceeds the d/D criteria under PWWF at approximately 93 percent capacity.	Capacity	15	18	Replace	1,400	$ 260	$ 592,000
Benson Lift Station	LS # 03 - Benson	Benson Avenue	Increase the firm capacity from 0.22 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.22	2.6	Replace	-	$ 1,284,477	$ 2,087,000
Codoni Lift Station	LS #16	Codoni Ave	The existing lift station is in poor condition, and will be replaced with a new lift station.	Rehabilitation	1.25 mgd	2.5 mgd	Replace	-	-	$ 2,000,000
Area 9										
River Trunk Tributary										
Gravity Pipeline	B-1	Spokane Street/Cascade Avenue	Inspections along this reach have observed missing aggregate and visible reinforcement. This method of rehabilitation will involve CIPP lining.	Rehabilitation	30	-	Rehab	2,799	$ -	$ 1,144,024
City-wide										
Storm Drain	SDR	Various Locations	Remove storm drain connections from the sewer collection system.	Storm Drain Removal	-	-	-	-		$ 12,500,000
Rehabilitation & Replacement	R&R	Various Locations	Small and Large Diameter Rehabilitation and Replacement Program.	Rehabilitation	-	-	-	-		$ 25,654,207
Existing Improvements Cost Estimate										212,677,429

Table C.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)
Future System Improvements										
Area 1										
West Trunk										
Gravity Pipeline	W-1	Carpenter Road to Sutter Plant	Build-out PWWF causes the lower reach of the West Trunk to exceed the maximum depth criteria at approximately 90 percent capacity.	Capacity	-	48	New	5,200	$ 643	$ 5,437,000
Gravity Pipeline	W-3	Undeveloped Area	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	15	New	4,000	$ 239	$ 1,554,000
Force Main	W-4	North Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	6	New	9,000	$ 171	$ 2,506,000
Gravity Pipeline	W-6	Kansas Avenue	This improvement is recommended to service future growth within the Highway 132 CPD.	New Growth	-	15	New	4,300	$ 239	$ 1,669,000
Gravity Pipeline	W-7	Carpenter Road and Paradise Road	This improvement is recommended to service infill as the sewer service area extends to include county islands.	New Growth	-	12	New	2,900	$ 190	$ 895,000
Kansas Lift Station	LS # 63	Kansas Avenue and Altamont Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	2.0 mgd	New	-	$ 1,059,519	$ 1,723,000
Dakota Lift Station	LS # 64	Dakota Road and Beckwith Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.0 mgd	New	-	$ 705,180	$ 1,146,000
Woodland Lift Station[5]	LS # 39	Woodland Avenue and Poust Road	It is proposed that the firm capacity be increased to 25.2 mgd from its current capacity of 20.9 mgd to meet future PWWFs.	Capacity	27.4 mgd	32.4 mgd	Expand	-	-	$ 1,293,000
Rumble Trunk										
Gravity Pipeline	R-1	Claremont Avenue and Maud Kump Terrace	Under PWWF conditions, this reach of the Rumble Trunk experiences flow depths in excess of the maximum d/D at approximately 90-percent capacity.	Capacity	21	24	Replace	5,100	$ 347	$ 2,878,000
Gravity Pipeline	R-2	McHenry Avenue	This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD.	New Growth	-	10	New	900	$ 160	$ 234,000
Dale Trunk										
Gravity Pipeline	D-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	15	New	1,200	$ 239	$ 466,000
Force Main	D-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	6	New	2,600	$ 171	$ 723,000
Gravity Pipeline	D-3	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	12	New	1,700	$ 190	$ 525,000
Gravity Pipeline	D-4	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	10	New	2,200	$ 160	$ 570,000
Gravity Pipeline	D-5	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	8	New	1,500	$ 127	$ 310,000
Chapman Lift Station	LS # 60	Chapman Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.6 mgd	New	-	$ 914,986	$ 1,487,000
North Trunk Extension										
Gravity Pipeline	N-1	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	27	New	2,800	$ 390	$ 1,776,000
Gravity Pipeline	N-2	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	24	New	6,100	$ 347	$ 3,443,000
Gravity Pipeline	N-3	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	21	New	1,600	$ 303	$ 788,000
Gravity Pipeline	N-4	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	18	New	3,100	$ 260	$ 1,310,000
Gravity Pipeline	N-5	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	2,400	$ 239	$ 931,000
Gravity Pipeline	N-6	Tully Road and Pelandale Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	4,800	$ 160	$ 179,000
Gravity Pipeline	N-7	American Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	3,100	$ 239	$ 1,204,000
Gravity Pipeline	N-8	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	5,600	$ 160	$ 1,453,000
Gravity Pipeline	N-9	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	8	New	6,300	$ 127	$ 1,300,000
Pelandale Lift Station	LS # 59	Pelandale Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.28	New	-	$ 462,738	$ 752,000
Kiernan Lift Station	LS # 65	Kiernan Avenue and Carver Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.48	New	-	$ 529,177	$ 860,000

Table C.1 Collection System Capital Improvement Program
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Project	Project Number	Description/ Street	Purpose	Improvement Category	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)
Area 3										
Sutter Trunk										
Gravity Pipeline	ST-1	Jefferson Street and Paradise Road	The trunk in Jefferson Avenue exceeds the d/D criteria when Jefferson LS is abandoned. There is also corrosion concerns.	Reliability	16	24	Replace			$ 5,000,000
Gravity Pipeline	ST-2	Sutter Avenue	The trunk in Jefferson Avenue exceeds the d/D criteria when Jefferson LS is abandoned. There is also corrosion concerns.	Reliability	18	24	Replace			$ 5,000,000
Area 6										
Sonoma Trunk Extension										
Gravity Pipeline	SO-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-		New			$ 2,300,000
Gravity Pipeline	SO-3	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	18	New	2,800	$ 260	$ 3,000,000
Gravity Pipeline	SO-4	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	15	New	2,800	$ 239	$ 1,087,000
Wood Sorrel Lift Station	LS # 61	North of Wood Sorrel Drive and Sylvan Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.14	New	-	$ 417,280	$ 678,000
Lakewood Trunk Extension										
Gravity Pipeline	L-1	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	18	New	2,900	$ 260	$ 1,225,000
Gravity Pipeline	L-2	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	15	New	1,700	$ 239	$ 660,000
Gravity Pipeline	L-3	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	12	New	800	$ 190	$ 247,000
Gravity Pipeline	L-4	Plainview Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	3,000	$ 160	$ 778,000
Gravity Pipeline	L-5	Claus Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	8	New	300	$ 127	$ 62,000
Gravity Pipeline	L-6	Merle Ave	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	400	$ 160	$ 104,000
Litt Lift Station	LS # 67	Litt Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.28	New	-	$ 801,924	$ 1,303,000
Area 10										
Ustick Trunk										
Gravity Pipeline	U-1	Ustick Road	At build-out of Area 10, the PWWF from new growth will cause the Ustick Trunk to surcharge.	Capacity	12	15	Replace	2,100	$ 239	$ 816,000
Gravity Pipeline	U-2	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	1,000	$ 160	$ 260,000
Force Main	U-3	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	4	New	427	$ 168	$ 117,000
Gravity Pipeline	U-4	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	3,400	$ 160	$ 882,000
Whitmore/Carpenter Lift Station	LS # 62	Whitmore Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.8	New	-	$ 636,411	$ 1,034,000
Future Improvements Cost Estimate										61,965,000
Total Capital Improvement Cost Estimate										274,642,429

Notes:

1. Costs are provided as present value based on an ENR CCI number of 11699 corresponding to the 20-City Average Index in February 2021. Costs are not escalated to future years.
2. Total construction cost includes the baseline construction cost plus a 25 percent allowance to account for unforeseen events and unknown conditions. Total project cost includes a 30 percent allowance to cover other costs including engineering, construction management, and project administration.
3. Cost estimates are from the River Trunk Realignment, Beard Brook Siphon and Cannery Segregation Line Improvement Project PDR.
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the 2007 Master Plan and was escalated to reflect the most probable current cost.
6. Lift station capacities refer to the total capacity unless noted otherwise.

Table C.1 Collection System Capital Improvement
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Project	Project Number	2021							2022						
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Existing System Improvements															
Area 1															
West Trunk															
Gravity Pipeline	A-3		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	C-1		100%		0%		0%			100%		0%		0%	
Area 2															
Emerald Trunk Tributary															
Gravity Pipeline	B-2		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	D-2		100%		0%		0%			100%		0%		0%	
Sutter Trunk															
Gravity Pipeline[4]	S-4a	$ 1,000,000	100%	$ 1,000,000	0%		0%		$ 1,000,000	100%	$ 1,000,000	0%		0%	
Gravity Pipeline[4]	S-4b	$ 600,000	100%	$ 600,000	0%		0%		$ 600,000	100%	$ 600,000	0%		0%	
Gravity Pipeline	A-2		100%		0%		0%		$ 846,216	100%	$ 846,216	0%		0%	
Area 3															
River Trunk															
Gravity Pipeline[3,4]	Project 1		59%		41%		0%		$ 13,599,840	59%	$ 8,023,905	41%	$ 5,575,934	0%	
Gravity Pipeline[3,4]	Project 2	$ 11,248,500	59%	$ 6,636,615	41%	$ 4,611,885	0%		$ 11,248,500	59%	$ 6,636,615	41%	$ 4,611,885	0%	
Gravity Pipeline[3,4]	Project 3	$ 1,800,000	59%	$ 1,062,000	41%	$ 738,000	0%		$ 7,200,000	59%	$ 4,248,000	41%	$ 2,952,000	0%	
Gravity Pipeline[3,4]	RT-10		59%		41%		0%			59%		41%		0%	
River Bank Armament[3,4]	RT-11		59%		41%		0%			59%		41%		0%	
Area 4															
Downtown Trunks															
Gravity Pipeline	DT-1		96%		4%		0%			96%		4%		0%	
Gravity Pipeline	DT-2		96%		4%		0%		$ 309,000	96%	$ 296,269	4%	$ 12,731	0%	
Gravity Pipeline	C-3		96%		4%		0%			96%		4%		0%	
Gravity Pipeline	D-1		96%		4%		0%			96%		4%		0%	
Gravity Pipeline	EM-1		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	EM-2		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	LL-1		100%		0%		0%		$ 1,000,000	100%	$ 1,000,000	0%		0%	
Gravity Pipeline	LL-2		100%		0%		0%			100%		0%		0%	

Table C.1 Collection System Capital Improvement
Engineer's Report
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Project	Project Number	2021							2022						
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Area 5															
Santa Rosa Trunk															
Gravity Pipeline	SR-4		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	SR-6		100%		0%		0%			100%		0%		0%	
Rose and Celeste Trunk															
Gravity/Force Main	A-1		100%		0%		0%		$ 1,000,000	100%	$ 1,000,000	0%		0%	
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste		100%		0%		0%			100%		0%		0%	
Area 6															
Empire Trunk															
Gravity Pipeline	EM-3		86%		14%		0%			86%		14%		0%	
Gravity Pipeline	EM-4		97%		3%		0%			97%		3%		0%	
Benson Lift Station	LS # 03 - Benson		100%		0%		0%			100%		0%		0%	
Codoni Lift Station	LS #16	$ 500,000	100%	$ 500,000	0%		0%		$ 1,500,000	100%	$ 1,500,000	0%		0%	
Area 9															
River Trunk Tributary															
Gravity Pipeline	B-1		100%		0%		0%			100%		0%		0%	
City-wide															
Storm Drain	SDR	$ 500,000	100%	$ 500,000	0%		0%		$ 3,000,000	100%	$ 3,000,000	0%		0%	
Rehabilitation & Replacement	R&R	$ 500,000	100%	$ 500,000	0%		0%		$ 500,000	100%	$ 500,000	0%		0%	
Existing Improvements Cost Estimate		16,148,500							41,803,557						

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2021						2022					
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Future System Improvements															
Area 1															
West Trunk															
Gravity Pipeline	W-1		66%		34%		0%			66%		34%		0%	
Gravity Pipeline	W-3		0%		100%		0%			0%		100%		0%	
Force Main	W-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-6		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-7		0%		100%		0%			0%		100%		0%	
Kansas Lift Station	LS # 63		0%		100%		0%			0%		100%		0%	
Dakota Lift Station	LS # 64		0%		100%		0%			0%		100%		0%	
Woodland Lift Station[5]	LS # 39		61%		39%		0%			61%		39%		0%	
Rumble Trunk															
Gravity Pipeline	R-1		81%		19%		0%			81%		19%		0%	
Gravity Pipeline	R-2		0%		100%		0%			0%		100%		0%	
Dale Trunk															
Gravity Pipeline	D-1		0%		100%		0%			0%		100%		0%	
Force Main	D-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-5		0%		100%		0%			0%		100%		0%	
Chapman Lift Station	LS # 60		0%		100%		0%			0%		100%		0%	
North Trunk Extension															
Gravity Pipeline	N-1		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-5		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-6		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-7		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-8		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-9		0%		100%		0%			0%		100%		0%	
Pelandale Lift Station	LS # 59		0%		100%		0%			0%		100%		0%	
Kiernan Lift Station	LS # 65		0%		100%		0%			0%		100%		0%	

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2021							2022						
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Area 3															
Sutter Trunk															
Gravity Pipeline	ST-1	$ 500,000	74%	$ 371,809	26%	$ 128,191	0%		$ 2,250,000	74%	$ 1,673,141	26%	$ 576,859	0%	
Gravity Pipeline	ST-2		74%		26%		0%			74%		26%		0%	
Area 6															
Sonoma Trunk Extension															
Gravity Pipeline	SO-2		0%		100%		0%		$ 2,300,000	0%		100%	$ 2,300,000	0%	
Gravity Pipeline	SO-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	SO-4		0%		100%		0%			0%		100%		0%	
Wood Sorrel Lift Station	LS # 61		0%		100%		0%		$ 678,000	0%		100%	$ 678,000	0%	
Lakewood Trunk Extension															
Gravity Pipeline	L-1		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	L-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	L-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	L-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	L-5		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	L-6		0%		100%		0%			0%		100%		0%	
Litt Lift Station	LS # 67		0%		100%		0%			0%		100%		0%	
Area 10															
Ustick Trunk															
Gravity Pipeline	U-1		44%		56%		0%			44%		56%		0%	
Gravity Pipeline	U-2		0%		100%		0%			0%		100%		0%	
Force Main	U-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	U-4		0%		100%		0%			0%		100%		0%	
Whitmore/Carpenter Lift Station	LS # 62		0%		100%		0%			0%		100%		0%	
Future Improvements Cost Estimate		500,000							5,228,000						
Total Capital Improvement Cost Estimate		16,648,500							47,031,557						

Notes:
1. Costs are provided as present value based on an
2. Total construction cost includes the baseline cons
3. Cost estimates are from the River Trunk Realignm
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the
6. Lift station capacities refer to the total capacity unl

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 1															
		2023							2024								
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users			
			Existing Users		Future Users					Existing Users		Future Users					
			%	$	%	$	%	$		%	$	%	$	%	$		
Existing System Improvements																	
Area 1																	
West Trunk																	
Gravity Pipeline	A-3		100%		0%		0%			100%		0%		0%			
Gravity Pipeline	C-1		100%		0%		0%			100%		0%		0%			
Area 2																	
Emerald Trunk Tributary																	
Gravity Pipeline	B-2		100%		0%		0%			100%		0%		0%			
Gravity Pipeline	D-2		100%		0%		0%			100%		0%		0%			
Sutter Trunk										100%		0%		0%			
Gravity Pipeline[4]	S-4a		100%		0%		0%			100%		0%		0%			
Gravity Pipeline[4]	S-4b		100%		0%		0%			100%		0%		0%			
Gravity Pipeline	A-2		100%		0%		0%			100%		0%		0%			
Area 3																	
River Trunk																	
Gravity Pipeline[3,4]	Project 1	$ 40,799,519	59%	$ 24,071,716	41%	$ 16,727,803	0%		$ 13,599,840	59%	$ 8,023,905	41%	$ 5,575,934	0%			
Gravity Pipeline[3,4]	Project 2		59%		41%		0%			59%		41%		0%			
Gravity Pipeline[3,4]	Project 3		59%		41%		0%			59%		41%		0%			
Gravity Pipeline[3,4]	RT-10		59%		41%		0%		$ 1,000,000	59%	$ 590,356	41%	$ 409,644	0%			
River Bank Armament[3,4]	RT-11		59%		41%		0%			59%		41%		0%			
Area 4																	
Downtown Trunks																	
Gravity Pipeline	DT-1		96%		4%		0%			96%		4%		0%			
Gravity Pipeline	DT-2		96%		4%		0%			96%		4%		0%			
Gravity Pipeline	C-3		96%		4%		0%			96%		4%		0%			
Gravity Pipeline	D-1		96%		4%		0%			96%		4%		0%			
Gravity Pipeline	EM-1	$ 500,000	100%	$ 500,000	0%		0%		$ 1,500,000	100%	$ 1,500,000	0%		0%			
Gravity Pipeline	EM-2		100%		0%		0%			100%		0%		0%			
Gravity Pipeline	LL-1	$ 1,500,000	100%	$ 1,500,000	0%		0%			100%		0%		0%			
Gravity Pipeline	LL-2		100%		0%		0%			100%		0%		0%			

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 1													
		2023								2024					
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Area 5															
Santa Rosa Trunk															
Gravity Pipeline	SR-4		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	SR-6	$ 358,000	100%	$ 358,000	0%		0%			100%		0%		0%	
Rose and Celeste Trunk															
Gravity/Force Main	A-1	$ 1,631,000	100%	$ 1,631,000	0%		0%			100%		0%		0%	
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste		100%		0%		0%			100%		0%		0%	
Area 6															
Empire Trunk															
Gravity Pipeline	EM-3		86%		14%		0%			86%		14%		0%	
Gravity Pipeline	EM-4		97%		3%		0%			97%		3%		0%	
Benson Lift Station	LS # 03 - Benson		100%		0%		0%			100%		0%		0%	
Codoni Lift Station	LS #16		100%		0%		0%			100%		0%		0%	
Area 9															
River Trunk Tributary															
Gravity Pipeline	B-1	$ 1,144,024	100%	$ 1,144,024	0%		0%			100%		0%		0%	
City-wide															
Storm Drain	SDR	$ 500,000	100%	$ 500,000	0%		0%		$ 500,000	100%	$ 500,000	0%		0%	
Rehabilitation & Replacement	R&R	$ 500,000	100%	$ 500,000	0%		0%		$ 500,000	100%	$ 500,000	0%		0%	
Existing Improvements Cost Estimate		46,932,543							17,099,840						

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 1											
		2023						2024					
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Future System Improvements															
Area 1															
West Trunk															
Gravity Pipeline	W-1		66%		34%		0%			66%		34%		0%	
Gravity Pipeline	W-3		0%		100%		0%			0%		100%		0%	
Force Main	W-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-6		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-7		0%		100%		0%			0%		100%		0%	
Kansas Lift Station	LS # 63		0%		100%		0%			0%		100%		0%	
Dakota Lift Station	LS # 64		0%		100%		0%			0%		100%		0%	
Woodland Lift Station[(5)]	LS # 39		61%		39%		0%			61%		39%		0%	
Rumble Trunk															
Gravity Pipeline	R-1		81%		19%		0%			81%		19%		0%	
Gravity Pipeline	R-2		0%		100%		0%			0%		100%		0%	
Dale Trunk															
Gravity Pipeline	D-1		0%		100%		0%			0%		100%		0%	
Force Main	D-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-5		0%		100%		0%			0%		100%		0%	
Chapman Lift Station	LS # 60		0%		100%		0%			0%		100%		0%	
North Trunk Extension															
Gravity Pipeline	N-1		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-5		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-6		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-7		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-8		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-9		0%		100%		0%			0%		100%		0%	
Pelandale Lift Station	LS # 59		0%		100%		0%			0%		100%		0%	
Kiernan Lift Station	LS # 65		0%		100%		0%			0%		100%		0%	

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 1															
		2023								2024							
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users			
			Existing Users		Future Users					Existing Users		Future Users					
			%	$	%	$	%	$		%	$	%	$	%	$		
Area 3																	
Sutter Trunk																	
Gravity Pipeline	ST-1	$ 2,250,000	74%	$ 1,673,141	26%	$ 576,859	0%			74%		26%		0%			
Gravity Pipeline	ST-2		74%		26%		0%			74%		26%		0%			
Area 6																	
Sonoma Trunk Extension																	
Gravity Pipeline	SO-2		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	SO-3		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	SO-4		0%		100%		0%			0%		100%		0%			
Wood Sorrel Lift Station	LS # 61		0%		100%		0%			0%		100%		0%			
Lakewood Trunk Extension																	
Gravity Pipeline	L-1		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	L-2		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	L-3		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	L-4		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	L-5		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	L-6		0%		100%		0%			0%		100%		0%			
Litt Lift Station	LS # 67		0%		100%		0%			0%		100%		0%			
Area 10																	
Ustick Trunk																	
Gravity Pipeline	U-1		44%		56%		0%			44%		56%		0%			
Gravity Pipeline	U-2		0%		100%		0%			0%		100%		0%			
Force Main	U-3		0%		100%		0%			0%		100%		0%			
Gravity Pipeline	U-4		0%		100%		0%			0%		100%		0%			
Whitmore/Carpenter Lift Station	LS # 62		0%		100%		0%			0%		100%		0%			
Future Improvements Cost Estimate		2,250,000															
Total Capital Improvement Cost Estimate		49,182,543							17,099,840								

Notes:
1. Costs are provided as present value based on an
2. Total construction cost includes the baseline consi
3. Cost estimates are from the River Trunk Realignm
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the
6. Lift station capacities refer to the total capacity unl

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2025							Phase 2 2026-2030						
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Existing System Improvements															
Area 1															
West Trunk															
Gravity Pipeline	A-3		100%		0%		0%		$ 721,499	100%	$ 721,499	0%		0%	
Gravity Pipeline	C-1		100%		0%		0%		$ 18,668,047	100%	$ 18,668,047	0%		0%	
Area 2															
Emerald Trunk Tributary															
Gravity Pipeline	B-2		100%		0%		0%		$ 2,536,318	100%	$ 2,536,318	0%		0%	
Gravity Pipeline	D-2		100%		0%		0%		$ 45,458	100%	$ 45,458	0%		0%	
Sutter Trunk															
Gravity Pipeline[4]	S-4a		100%		0%		0%			100%		0%		0%	
Gravity Pipeline[4]	S-4b		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	A-2		100%		0%		0%			100%		0%		0%	
Area 3															
River Trunk															
Gravity Pipeline[3,4]	Project 1		59%		41%		0%			59%		41%		0%	
Gravity Pipeline[3,4]	Project 2		59%		41%		0%			59%		41%		0%	
Gravity Pipeline[3,4]	Project 3		59%		41%		0%			59%		41%		0%	
Gravity Pipeline[3,4]	RT-10	$ 15,398,648	59%	$ 9,090,690	41%	$ 6,307,958	0%			59%		41%		0%	
River Bank Armament[3,4]	RT-11		59%		41%		0%		$ 5,440,962	59%	$ 3,212,107	41%	$ 2,228,855	0%	
Area 4															
Downtown Trunks															
Gravity Pipeline	DT-1		96%		4%		0%		$ 931,000	96%	$ 889,863	4%	$ 41,137	0%	
Gravity Pipeline	DT-2		96%		4%		0%			96%		4%		0%	
Gravity Pipeline	C-3		96%		4%		0%		$ 1,208,714	96%	$ 1,155,306	4%	$ 53,408	0%	
Gravity Pipeline	D-1		96%		4%		0%		$ 644,570	96%	$ 618,014	4%	$ 26,556	0%	
Gravity Pipeline	EM-1		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	EM-2		100%		0%		0%		$ 4,000,000	100%	$ 4,000,000	0%		0%	
Gravity Pipeline	LL-1		100%		0%		0%			100%		0%		0%	
Gravity Pipeline	LL-2	$ 1,500,000	100%	$ 1,500,000	0%		0%		$ 2,000,000	100%	$ 2,000,000	0%		0%	

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2025							Phase 2 2026-2030							
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users		
			Existing Users		Future Users					Existing Users		Future Users				
			%	$	%	$	%	$		%	$	%	$	%	$	
Area 5																
Santa Rosa Trunk																
Gravity Pipeline	SR-4		100%		0%		0%		$ 621,000	100%	$ 621,000	0%		0%		
Gravity Pipeline	SR-6		100%		0%		0%			100%		0%		0%		
Rose and Celeste Trunk																
Gravity/Force Main	A-1		100%		0%		0%			100%		0%		0%		
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste		100%		0%		0%		$ 2,087,567	100%	$ 2,087,567	0%		0%		
Area 6																
Empire Trunk																
Gravity Pipeline	EM-3		86%		14%		0%		$ 556,000	86%	$ 477,506	14%	$ 78,494	0%		
Gravity Pipeline	EM-4		97%		3%		0%		$ 592,000	97%	$ 573,206	3%	$ 18,794	0%		
Benson Lift Station	LS # 03 - Benson		100%		0%		0%		$ 2,087,000	100%	$ 2,079,696	0%	$ 7,305	0%		
Codoni Lift Station	LS #16		100%		0%		0%			100%		0%		0%		
Area 9																
River Trunk Tributary																
Gravity Pipeline	B-1		100%		0%		0%			100%		0%		0%		
City-wide																
Storm Drain	SDR	$ 500,000	100%	$ 500,000	0%		0%		$ 2,500,000	100%	$ 2,500,000	0%		0%		
Rehabilitation & Replacement	R&R	$ 500,000	100%	$ 500,000	0%		0%		$ 2,500,000	100%	$ 2,500,000	0%		0%		
Existing Improvements Cost Estimate		17,898,648							47,140,134							

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2025						Phase 2 2026-2030						
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users	
			Existing Users		Future Users					Existing Users		Future Users			
			%	$	%	$	%	$		%	$	%	$	%	$
Future System Improvements															
Area 1															
West Trunk															
Gravity Pipeline	W-1		66%		34%		0%			66%		34%		0%	
Gravity Pipeline	W-3		0%		100%		0%			0%		100%		0%	
Force Main	W-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-6		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	W-7		0%		100%		0%			0%		100%		0%	
Kansas Lift Station	LS # 63		0%		100%		0%			0%		100%		0%	
Dakota Lift Station	LS # 64		0%		100%		0%			0%		100%		0%	
Woodland Lift Station[5]	LS # 39		61%		39%		0%			61%		39%		0%	
Rumble Trunk															
Gravity Pipeline	R-1		81%		19%		0%		$ 2,878,000	81%	$ 2,322,409	19%	$ 555,591	0%	
Gravity Pipeline	R-2		0%		100%		0%		$ 234,000	0%		100%	$ 234,000	0%	
Dale Trunk															
Gravity Pipeline	D-1		0%		100%		0%			0%		100%		0%	
Force Main	D-2		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	D-5		0%		100%		0%			0%		100%		0%	
Chapman Lift Station	LS # 60		0%		100%		0%			0%		100%		0%	
North Trunk Extension															
Gravity Pipeline	N-1		0%		100%		0%		$ 1,776,000	0%		100%	$ 1,776,000	0%	
Gravity Pipeline	N-2		0%		100%		0%		$ 3,443,000	0%		100%	$ 3,443,000	0%	
Gravity Pipeline	N-3		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-4		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-5		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-6		0%		100%		0%		$ 179,000	0%		100%	$ 179,000	0%	
Gravity Pipeline	N-7		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-8		0%		100%		0%			0%		100%		0%	
Gravity Pipeline	N-9		0%		100%		0%			0%		100%		0%	
Pelandale Lift Station	LS # 59		0%		100%		0%		$ 752,000	0%		100%	$ 752,000	0%	
Kiernan Lift Station	LS # 65		0%		100%		0%			0%		100%		0%	

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	2025							Phase 2 2026-2030							
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users		
			Existing Users		Future Users					Existing Users		Future Users				
			%	$	%	$	%	$		%	$	%	$	%	$	
Area 3																
Sutter Trunk																
Gravity Pipeline	ST-1		74%		26%		0%			74%		26%		0%		
Gravity Pipeline	ST-2		74%		26%		0%		$ 5,000,000	74%	$ 3,700,000	26%	$ 1,300,000	0%		
Area 6																
Sonoma Trunk Extension																
Gravity Pipeline	SO-2		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	SO-3	$ 3,000,000	0%		100%	$ 3,000,000	0%			0%		100%		0%		
Gravity Pipeline	SO-4		0%		100%		0%		$ 1,087,000	0%		100%	$ 1,087,000	0%		
Wood Sorrel Lift Station	LS # 61		0%		100%		0%			0%		100%		0%		
Lakewood Trunk Extension																
Gravity Pipeline	L-1		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	L-2		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	L-3		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	L-4		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	L-5		0%		100%		0%		$ 62,000	0%		100%	$ 62,000	0%		
Gravity Pipeline	L-6		0%		100%		0%			0%		100%		0%		
Litt Lift Station	LS # 67		0%		100%		0%			0%		100%		0%		
Area 10																
Ustick Trunk																
Gravity Pipeline	U-1		44%		56%		0%			44%		56%		0%		
Gravity Pipeline	U-2		0%		100%		0%			0%		100%		0%		
Force Main	U-3		0%		100%		0%			0%		100%		0%		
Gravity Pipeline	U-4		0%		100%		0%			0%		100%		0%		
Whitmore/Carpenter Lift Station	LS # 62		0%		100%		0%			0%		100%		0%		
Future Improvements Cost Estimate		3,000,000							15,411,000							
Total Capital Improvement Cost Estimate		20,898,648							62,551,134							

Notes:
1. Costs are provided as present value based on an
2. Total construction cost includes the baseline consi
3. Cost estimates are from the River Trunk Realignm
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the
6. Lift station capacities refer to the total capacity unl

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 3 2031-2035 Project Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $	Phase 4 2036-2040 Project Cost ($)	Domestic Users Existing Users %	Domestic Users Existing Users $	Domestic Users Future Users %	Domestic Users Future Users $	Can Seg Users %	Can Seg Users $	Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
Existing System Improvements																			
Area 1																			
West Trunk																			
Gravity Pipeline	A-3		100%		0%		0%			100%		0%		0%		0%	$ 721,499	$ 721,000	$ -
Gravity Pipeline	C-1		100%		0%		0%			100%		0%		0%		0%	$ 18,668,047	$ 18,668,000	$ -
Area 2																			
Emerald Trunk Tributary																			
Gravity Pipeline	B-2		100%		0%		0%			100%		0%		0%		0%	$ 2,536,318	$ 2,536,000	$ -
Gravity Pipeline	D-2		100%		0%		0%			100%		0%		0%		0%	$ 45,458	$ 45,458	$ -
Sutter Trunk																			
Gravity Pipeline[4]	S-4a		100%		0%		0%			100%		0%		0%		0%	$ 2,000,000	$ 2,000,000	$ -
Gravity Pipeline[4]	S-4b		100%		0%		0%			100%		0%		0%		0%	$ 1,200,000	$ 1,200,000	$ -
Gravity Pipeline	A-2		100%		0%		0%			100%		0%		0%		0%	$ 846,216	$ 846,216	$ -
Area 3																			
River Trunk																			
Gravity Pipeline[3,4]	Project 1		59%		41%		0%			59%		41%		0%		41%	$ 67,999,199	$ 40,120,000	$ 27,880,000
Gravity Pipeline[3,4]	Project 2		59%		41%		0%			59%		41%		0%		41%	$ 22,497,001	$ 13,273,000	$ 9,224,000
Gravity Pipeline[3,4]	Project 3		59%		41%		0%			59%		41%		0%		41%	$ 9,000,000	$ 5,310,000	$ 3,690,000
Gravity Pipeline[3,4]	RT-10		59%		41%		0%			59%		41%		0%		41%	$ 16,398,648	$ 9,681,000	$ 6,718,000
River Bank Armament[3,4]	RT-11		59%		41%		0%			59%		41%		0%		41%	$ 5,440,962	$ 3,212,000	$ 2,229,000
Area 4																			
Downtown Trunks																			
Gravity Pipeline	DT-1		96%		4%		0%			96%		4%		0%		4%	$ 931,000	$ 890,000	$ 41,000
Gravity Pipeline	DT-2		96%		4%		0%			96%		4%		0%		4%	$ 309,000	$ 296,000	$ 13,000
Gravity Pipeline	C-3		96%		4%		0%			96%		4%		0%		4%	$ 1,208,714	$ 1,155,000	$ 53,000
Gravity Pipeline	D-1		96%		4%		0%			96%		4%		0%		4%	$ 644,570	$ 618,000	$ 27,000
Gravity Pipeline	EM-1		100%		0%		0%			100%		0%		0%		0%	$ 2,000,000	$ 2,000,000	$ -
Gravity Pipeline	EM-2		100%		0%		0%			100%		0%		0%		0%	$ 4,000,000	$ 4,000,000	$ -
Gravity Pipeline	LL-1		100%		0%		0%			100%		0%		0%		0%	$ 2,500,000	$ 2,500,000	$ -
Gravity Pipeline	LL-2		100%		0%		0%			100%		0%		0%		0%	$ 3,500,000	$ 3,500,000	$ -

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 3 2031-2035							Phase 4 2036-2040							Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
		Project Cost ($)	Domestic Users				Can Seg Users		Project Cost ($)	Domestic Users				Can Seg Users					
			Existing Users		Future Users					Existing Users		Future Users							
			%	$	%	$	%	$		%	$	%	$	%	$				
Area 5																			
Santa Rosa Trunk																			
Gravity Pipeline	SR-4		100%		0%		0%			100%		0%		0%		0%	$ 621,000	$ 621,000	$ -
Gravity Pipeline	SR-6		100%		0%		0%			100%		0%		0%		0%	$ 358,000	$ 358,000	$ -
Rose and Celeste Trunk																			
Gravity/Force Main	A-1		100%		0%		0%			100%		0%		0%		0%	$ 2,631,000	$ 2,631,000	$ -
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste		100%		0%		0%			100%		0%		0%		0%	$ 2,087,567	$ 2,087,567	$ -
Area 6																			
Empire Trunk																			
Gravity Pipeline	EM-3		86%		14%		0%			86%		14%		0%		14%	$ 556,000	$ 478,000	$ 78,000
Gravity Pipeline	EM-4		97%		3%		0%			97%		3%		0%		3%	$ 592,000	$ 573,000	$ 19,000
Benson Lift Station	LS # 03 - Benson		100%		0%		0%			100%		0%		0%		0%	$ 2,087,000	$ 2,080,000	$ 7,000
Codoni Lift Station	LS #16		100%		0%		0%			100%		0%		0%		0%	$ 2,000,000	$ 2,000,000	$ -
Area 9																			
River Trunk Tributary																			
Gravity Pipeline	B-1		100%		0%		0%			100%		0%		0%		0%	$ 1,144,024	$ 1,144,024	$ -
City-wide																			
Storm Drain	SDR	$ 2,500,000	100%	$ 2,500,000	0%		0%		$ 2,500,000	100%	$ 2,500,000	0%		0%		0%	$ 12,500,000	$ 12,500,000	$ -
Rehabilitation & Replacement	R&R	$ 10,327,104	100%	$ 10,327,104	0%		0%		$ 10,327,104	100%	$ 10,327,104	0%		0%		0%	$ 25,654,207	$ 25,654,207	$ -
Existing Improvements Cost Estimate		12,827,104							12,827,104								212,677,000	162,698,000	49,979,000

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 3 2031-2035								Phase 4 2036-2040								Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
		Project Cost ($)	Domestic Users				Can Seg Users			Project Cost ($)	Domestic Users				Can Seg Users						
			Existing Users		Future Users						Existing Users		Future Users								
			%	$	%	$	%	$			%	$	%	$	%	$					
Future System Improvements																					
Area 1																					
West Trunk																					
Gravity Pipeline	W-1		66%		34%		0%			$ 5,437,000	66%	$ 3,577,927	34%	$ 1,859,073	0%			34%	$ 5,437,000	$ 3,578,000	$ 1,859,000
Gravity Pipeline	W-3		0%		100%		0%			$ 1,554,000	0%		100%	$ 1,554,000	0%			100%	$ 1,554,000	$ -	$ 1,554,000
Force Main	W-4		0%		100%		0%			$ 2,506,000	0%		100%	$ 2,506,000	0%			100%	$ 2,506,000	$ -	$ 2,506,000
Gravity Pipeline	W-6		0%		100%		0%			$ 1,669,000	0%		100%	$ 1,669,000	0%			100%	$ 1,669,000	$ -	$ 1,669,000
Gravity Pipeline	W-7	$ 895,000	0%		100%	$ 895,000	0%				0%		100%		0%			100%	$ 895,000	$ -	$ 895,000
Kansas Lift Station	LS # 63		0%		100%		0%			$ 1,723,000	0%		100%	$ 1,723,000	0%			100%	$ 1,723,000	$ -	$ 1,723,000
Dakota Lift Station	LS # 64		0%		100%		0%			$ 1,146,000	0%		100%	$ 1,146,000	0%			100%	$ 1,146,000	$ -	$ 1,146,000
Woodland Lift Station[5]	LS # 39	$ 1,293,000	61%	$ 789,578	39%	$ 503,422	0%				61%		39%		0%			39%	$ 1,293,000	$ 790,000	$ 503,000
Rumble Trunk																					
Gravity Pipeline	R-1		81%		19%		0%				81%		19%		0%			19%	$ 2,878,000	$ 2,322,000	$ 556,000
Gravity Pipeline	R-2		0%		100%		0%				0%		100%		0%			100%	$ 234,000	$ -	$ 234,000
Dale Trunk																					
Gravity Pipeline	D-1	$ 466,000	0%		100%	$ 466,000	0%				0%		100%		0%			100%	$ 466,000	$ -	$ 466,000
Force Main	D-2	$ 723,000	0%		100%	$ 723,000	0%				0%		100%		0%			100%	$ 723,000	$ -	$ 723,000
Gravity Pipeline	D-3	$ 525,000	0%		100%	$ 525,000	0%				0%		100%		0%			100%	$ 525,000	$ -	$ 525,000
Gravity Pipeline	D-4	$ 570,000	0%		100%	$ 570,000	0%				0%		100%		0%			100%	$ 570,000	$ -	$ 570,000
Gravity Pipeline	D-5	$ 310,000	0%		100%	$ 310,000	0%				0%		100%		0%			100%	$ 310,000	$ -	$ 310,000
Chapman Lift Station	LS # 60	$ 1,487,000	0%		100%	$ 1,487,000	0%				0%		100%		0%			100%	$ 1,487,000	$ -	$ 1,487,000
North Trunk Extension																					
Gravity Pipeline	N-1		0%		100%		0%				0%		100%		0%			100%	$ 1,776,000	$ -	$ 1,776,000
Gravity Pipeline	N-2		0%		100%		0%				0%		100%		0%			100%	$ 3,443,000	$ -	$ 3,443,000
Gravity Pipeline	N-3	$ 788,000	0%		100%	$ 788,000	0%				0%		100%		0%			100%	$ 788,000	$ -	$ 788,000
Gravity Pipeline	N-4	$ 1,310,000	0%		100%	$ 1,310,000	0%				0%		100%		0%			100%	$ 1,310,000	$ -	$ 1,310,000
Gravity Pipeline	N-5	$ 931,000	0%		100%	$ 931,000	0%				0%		100%		0%			100%	$ 931,000	$ -	$ 931,000
Gravity Pipeline	N-6		0%		100%		0%				0%		100%		0%			100%	$ 179,000	$ -	$ 179,000
Gravity Pipeline	N-7		0%		100%		0%			$ 1,204,000	0%		100%	$ 1,204,000	0%			100%	$ 1,204,000	$ -	$ 1,204,000
Gravity Pipeline	N-8		0%		100%		0%			$ 1,453,000	0%		100%	$ 1,453,000	0%			100%	$ 1,453,000	$ -	$ 1,453,000
Gravity Pipeline	N-9		0%		100%		0%			$ 1,300,000	0%		100%	$ 1,300,000	0%			100%	$ 1,300,000	$ -	$ 1,300,000
Pelandale Lift Station	LS # 59		0%		100%		0%				0%		100%		0%			100%	$ 752,000	$ -	$ 752,000
Kiernan Lift Station	LS # 65		0%		100%		0%			$ 860,000	0%		100%	$ 860,000	0%			100%	$ 860,000	$ -	$ 860,000

Table C.1 Collection System Capital Improvement
Engineer's Report
City of Modesto, California

Project	Project Number	Phase 3 2031-2035								Phase 4 2036-2040								Future Users Benefit (%)	Total Project Cost ($)	Existing Improvements ($)	Future Improvements ($)
		Project Cost ($)	Domestic Users				Can Seg Users			Project Cost ($)	Domestic Users				Can Seg Users						
			Existing Users		Future Users						Existing Users		Future Users								
			%	$	%	$	%	$			%	$	%	$	%	$					
Area 3																					
Sutter Trunk																					
Gravity Pipeline	ST-1		74%		26%		0%											26%	$ 5,000,000	$ 3,718,000	$ 1,282,000
Gravity Pipeline	ST-2		74%		26%		0%											26%	$ 5,000,000	$ 3,700,000	$ 1,300,000
Area 6																					
Sonoma Trunk Extension																					
Gravity Pipeline	SO-2		0%		100%		0%											100%	$ 2,300,000	$ -	$ 2,300,000
Gravity Pipeline	SO-3		0%		100%		0%											100%	$ 3,000,000	$ -	$ 3,000,000
Gravity Pipeline	SO-4		0%		100%		0%											100%	$ 1,087,000	$ -	$ 1,087,000
Wood Sorrel Lift Station	LS # 61		0%		100%		0%											100%	$ 678,000	$ -	$ 678,000
Lakewood Trunk Extension																					
Gravity Pipeline	L-1	$ 1,225,000	0%		100%	$ 1,225,000	0%											100%	$ 1,225,000	$ -	$ 1,225,000
Gravity Pipeline	L-2	$ 660,000	0%		100%	$ 660,000	0%											100%	$ 660,000	$ -	$ 660,000
Gravity Pipeline	L-3	$ 247,000	0%		100%	$ 247,000	0%											100%	$ 247,000	$ -	$ 247,000
Gravity Pipeline	L-4	$ 778,000	0%		100%	$ 778,000	0%											100%	$ 778,000	$ -	$ 778,000
Gravity Pipeline	L-5		0%		100%		0%											100%	$ 62,000	$ -	$ 62,000
Gravity Pipeline	L-6		0%		100%		0%			$ 104,000								100%	$ 104,000	$ -	$ 104,000
Litt Lift Station	LS # 67	$ 1,303,000	0%		100%	$ 1,303,000	0%											100%	$ 1,303,000	$ -	$ 1,303,000
Area 10																					
Ustick Trunk																					
Gravity Pipeline	U-1		44%		56%		0%			$ 816,000								56%	$ 816,007	$ 356,000	$ 460,000
Gravity Pipeline	U-2		0%		100%		0%			$ 260,000								100%	$ 260,000	$ -	$ 260,000
Force Main	U-3		0%		100%		0%			$ 117,000								100%	$ 117,007	$ -	$ 117,007
Gravity Pipeline	U-4		0%		100%		0%			$ 882,000								100%	$ 882,000	$ -	$ 882,000
Whitmore/Carpenter Lift Station	LS # 62		0%		100%		0%			$ 1,034,000								100%	$ 1,034,007	$ -	$ 1,034,007
Future Improvements Cost Estimate		13,511,000								22,065,000									61,965,000	14,464,000	47,501,000
Total Capital Improvement Cost Estimate		26,338,104								34,892,104									274,642,000	177,162,000	97,480,000

Notes:
1. Costs are provided as present value based on an
2. Total construction cost includes the baseline consi
3. Cost estimates are from the River Trunk Realignm
4. Pricing from final design efforts.
5. The cost for Woodlake Lift Station is based on the
6. Lift station capacities refer to the total capacity unl

Appendix D

2016 ENGINEER'S REPORT

1/29/2016

CITY OF MODESTO

ENGINEER'S REPORT
JUSTIFICATION AND COST ALLOCATION FOR PROPOSED WASTEWATER COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENTS

FINAL
January 2016

2700 YGNACIO VALLEY ROAD, SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • P. 925.932.1710 • F. 925.930.0208

CITY OF MODESTO

ENGINEER'S REPORT
JUSTIFICATION AND COST ALLOCATION FOR PROPOSED WASTEWATER COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENTS

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ENGINEER'S REPORT - JUSTIFICATION AND COST ALLOCATION FOR PROPOSED WASTEWATER COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENTS

1.0 INTRODUCTION

The purpose of the Engineer's Report is to provide the basis for establishing wastewater sewer service charges and connection fees to fund the wastewater Capital Improvement Program (CIP). This report lists project costs, describes project phasing, and explains the methodologies used to allocate costs to different categories of customers.

The wastewater CIP was developed from the draft 2016 Wastewater Master Plan currently in progress. This plan identified deficiencies and capacity needs for the wastewater treatment system and collection system (sewers) from now until the year 2035. These needs were based on projected growth and land use patterns for the City's current service area and unserved areas that extend to the sphere of influence (SOI) boundaries.

The CIP includes improvements in the following areas:

- Collection System Improvements, including:
  - Pipeline replacement/addition to provide hydraulic capacity for peak wet weather flows (PWWFs).
  - New sewers or extensions of sewers to serve future customers.
  - Rehabilitation and replacement improvements.
  - Upgrades to improve reliability.
  - Removal of storm drain cross connections.
- Sutter Avenue Primary Treatment Plant (Sutter Plant) improvements to improve treatment reliability and increase capacity.
- Outfall Pipelines to improve reliability and increase capacity.
- Jennings Road Secondary/Tertiary Treatment Plant (Jennings Plant) improvements to improve reliability and increase capacity.

2.0 SUMMARY OF RECOMMENDED COST ALLOCATIONS

Estimated costs and recommended cost allocations to customers are summarized in Table 1.

3.0 COLLECTION SYSTEM SERVICE AREA AND PROJECTED WASTEWATER CONTRIBUTIONS

3.1 Study Area and Population Projections

The study area for this report includes current city limits, a portion of north Ceres, the unincorporated community of Empire, and isolated unincorporated Stanislaus County land ("islands") within city limits. For north Ceres and unincorporated areas, the City treats wastewater under separate sewer service agreements. The study area (shown in Figure 1) encompasses the City's SOI boundary, Empire, and north Ceres, which is consistent with the City's updated Urban Area General Plan.

The City provides wastewater (sewer) service for over 200,000 customers within city limits and approximately 900 customers within the Empire Sanitary District. Population and land use projections prepared for the Master Plan indicate that areas extending to the SOI boundaries will be only partially developed by the end of 2035. In fact, full build-out of the SOI is not expected until the year 2057. By 2035, the number of municipal customers is projected to increase at an average growth rate of 1.3 percent to a total service population of 270,900.

In addition to municipal customers, the City serves industries in the Beard Industrial Park. These industries include seasonal canneries and year-round food processors. The City's conveyance and treatment systems will be modified to accommodate these flows separately from the domestic wastewater treatment systems. To do this, process water leaving the industries, known locally as "Can Seg" flow, will flow directly to the Jennings Plant by separate piping. At the Jennings Plant, Can Seg flow will either be used to irrigate ranch land or will be treated with the upgraded secondary treatment facilities. This will depend on the season or the current conditions.

3.2 Existing Wastewater Facilities

The City’s wastewater collection system consists of approximately 620 miles of sanitary sewer lines, ranging from 4 inches to 66 inches in diameter, and 41 lift stations. Another 32 miles of sewers that are either privately owned or associated with north Ceres are connected to the City's collection system.

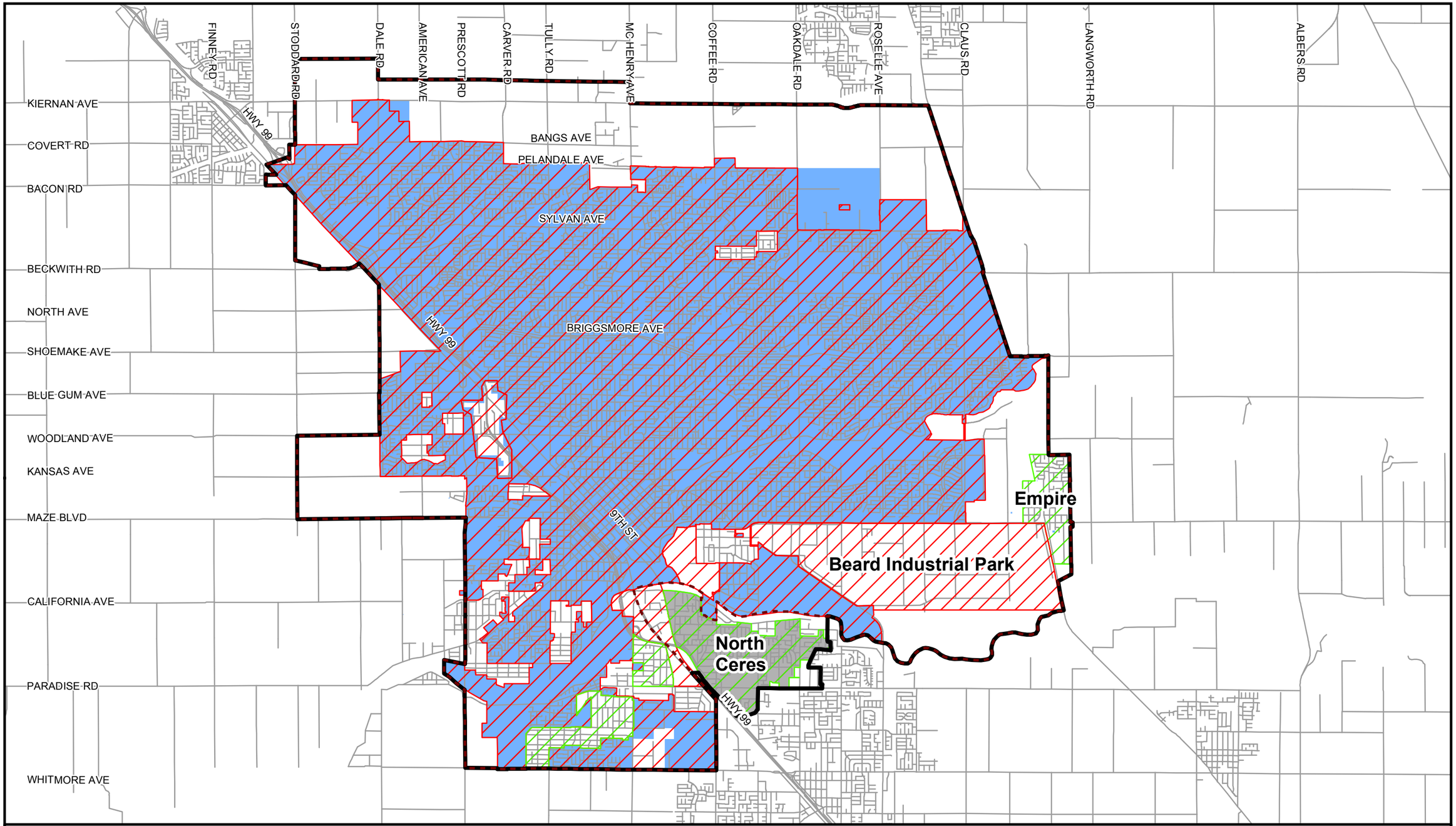
With the exception of localized septic systems, all wastewater generated within the service area receives treatment at the City’s treatment facilities. These facilities consist of two treatment plants that operate in series and are connected by two 6.5-mile long outfall pipelines (see Figure 2).

The Sutter Plant is located at the south end of Sutter Avenue adjacent to the Tuolumne River. There, the plant provides primary treatment and solids handling. Most of the primary

Table 1 **Recommended Cost Allocations**
Engineer's Report
City of Modesto, California

Project Component	Total Project Cost[1]	Domestic Users				Can Seg Users		Comments
		Existing Users		Future Users				
		$	%	$	%	$	%	
Collection System								
Capacity Improvements	$103.6	$65.1	62.8%	$38.6	37.2%	$ -	-	Improvements are primarily for existing deficiencies. Where future capacity is provided, allocations are based on PWWF.
New Growth Improvements	35.4	-	0.0	35.4	100.0	-	-	Includes extensions for future capacity.
Rehabilitation and Replacement	56.0	50.1	89.3	6.0	10.7	-	-	Project-by-project allocation is based on relative PWWF.
Reliability Improvements	5.6	3.5	61.8	2.1	38.2	-	-	Project-by-project allocation is based on relative PWWF.
Storm Drain Removal	17.0	17.0	100.0	-	0.0	-	-	Improvements are for existing deficiencies.
Total - Collection System	**$217.7**	**$135.6**	**62.3%**	**$82.1**	**37.7%**	**-**	**-**	
Wastewater Treatment Improvements								
Sutter Plant Improvements								
Influent Pump Station Improvements	$ 2.2	$ -	0.0%	$ 2.2	100.0%	$ -	0.0%	Improvement for future growth.
Headworks Improvements[2]	14.8	7.6	51.5	1.5	10.4	5.7	38.1	Includes replacement and expansion. Allocation is based on relative PWWF.
Outfall Pump Station Replacement	17.3	14.4	83.2	2.9	16.8	-	0.0	Includes replacement and expansion. Allocation is based on relative PWWF.
Decommission of Abandoned Facilities	4.9	3.7	74.5	1.2	25.5	-	0.0	Allocation is based on relative maximum month flow (MMF).
Allowance for Flood Protection	2.0	2.0	100.0	-	0.0	-	0.0	Improvements for an existing condition.
Subtotal - Sutter Plant	**$41.3**	**$27.7**	**67.1%**	**$ 7.9**	**19.2%**	**$ 5.7**	**13.7%**	
Outfall Pipelines Improvements								
Tuolumne River Crossings	$26.0	$ 9.1	35.0%	$ 1.8	7.1%	$15.1	58.0%	Includes upgrade and expansion; 100% of Can Seg Outfall crossing and 20% of Domestic Outfall and Third Outfall crossings allocated to Can Seg. Domestic allocation is based on relative PWWF.
Constructing a Third Outfall	60.7	40.4	66.5	8.2	13.5	12.1	20.0	Allocates 20% to Can Seg. Domestic allocation is based on relative PWWF.
Slip Lining the Can Seg Outfall	10.5	-	0.0	-	0.0	10.5	100.0	Benefits only Can Seg customers.
Subtotal - Outfall Facilities	**$97.2**	**$49.5**	**50.9%**	**$10.0**	**10.3%**	**$37.7**	**38.8%**	
Jennings Plant Improvements								
Secondary Treatment/Can Seg Treatment Facilities[3]	$ 52.4	$ 8.6	16.4%	$ 2.9	5.6%	$40.9	78.0%	Includes upgrade and expansion. Allocation is based on BOD loading to secondary treatment facilities.
Primary Treatment and Solids Handling Facilities[4]	93.5	69.6	74.5	23.9	25.5	-	0.0	Includes replacement and upgrade. Allocation is based on relative MMF.
Miscellaneous Repairs	0.9	0.1	16.6	<0.1	5.7	0.7	77.6	Allocation is based on BOD loading to secondary treatment facilities.
Subtotal - Jennings Plant	**$146.8**	**$78.4**	**53.4%**	**$26.9**	**18.3%**	**$41.6**	**28.3%**	
Engineering Studies								
Master Plan Updates	$2.0	$1.1	54.5%	$0.3	15.7%	$0.6	29.8%	Allocation is based on overall allocation percentages for total CIP.
Land Application Study	0.3	-	0.0	-	0.0	0.3	100.0	Includes a study to determine BOD loading for the land application of Can Seg flows.
Subtotal - Engineering Studies	**$2.3**	**$1.1**	**48.4%**	**$0.3**	**14.0%**	**$0.8**	**37.6%**	
Total - Wastewater Treatment	**$287.6**	**$156.7**	**54.5%**	**$45.1**	**15.7%**	**$85.8**	**29.8%**	
Total - Collection System and Wastewater Treatment Improvements	**$505.3**	**$292.3**	**57.8%**	**$127.2**	**25.2%**	**$85.8**	**17.0%**	

Notes:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.
(2) Includes New Dryden Box, New West Junction Structure, Influent Screening Improvements, Grit Removal Improvements, Ventilation Improvements, Influent Flume Improvements, and Pumping Plant No. 3 Improvements.
(3) Includes Fixed Film Reactors and Pump Station Rehabilitation, Nutrient Feed and pH Control Systems, Peroxide Feed System, Aerator Addition in Recirculation Channel, and DAF Piping Modifications.
(4) Includes Primary Treatment Facilities, Yard Piping and Structures, Anaerobic Digesters, WAS Thickening and Biosolids Dewatering, and Sludge Cake Drying Beds.



Legend

- City Limits
- Study Area Boundary
- Sphere of Influence
- North Ceres
- Roads

Modesto Municipal District #1

- MMSD No. 1 Sewer Service Area
- Sewer Service by Agreement

Source: Collection System Master Plan

carollo

N

0 1 2 Miles

SEWER SERVICE STUDY AREA

FIGURE 1

CITY OF MODESTO
ENGINEER'S REPORT

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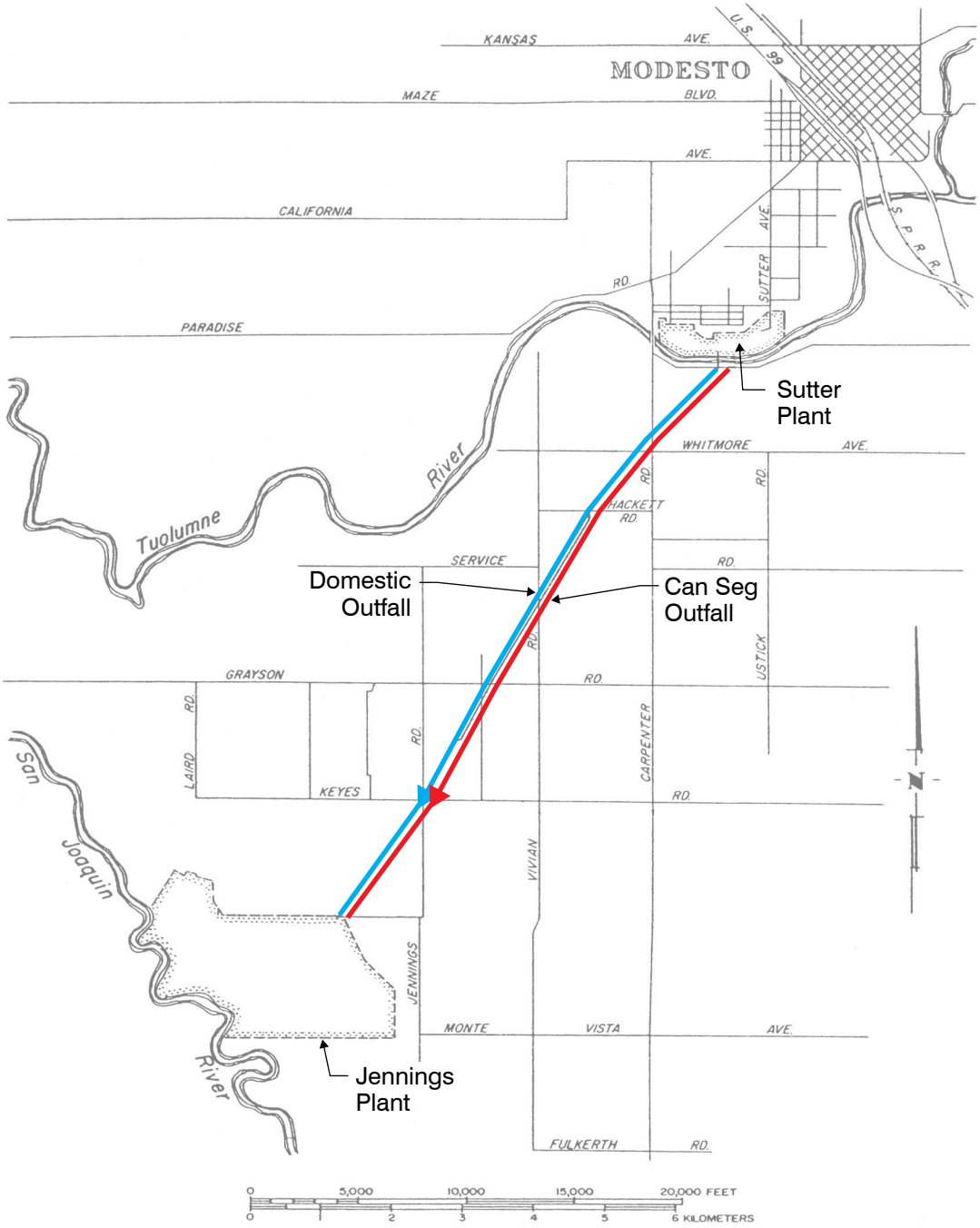


WASTEWATER TREATMENT FACILITIES SITE LOCATION

Source: Wastewater Treatment Master Plan

FIGURE 2

CITY OF MODESTO
ENGINEER'S REPORT

treatment and solids handling facilities are old and nearing the ends of their useful lives. The Sutter Plant's location near the Tuolumne River also creates a flood risk.

Primary effluent from the Sutter Plant flows through the two 6.5-mile long outfall pipelines to the Jennings Plant, which is located next to the San Joaquin River (SJR) on Jennings Road near the intersection with West Zeering Road. The Jennings Plant treatment processes include secondary treatment, tertiary treatment, and a 2,526-acre ranch irrigated with secondary effluent during the irrigation season and Can Seg flows during the canning season. During the non-irrigation season, secondary effluent is either stored in the City's two storage ponds or discharged to the SJR from October to May. Tertiary effluent is used in the same manner. Although this is the current practice, the City will implement an offsite tertiary recycled water project by early 2018 that will utilize all tertiary flows.

3.3 Wastewater Flow Categories

Wastewater from the Modesto service area comes from two main sources: domestic flows and Can Seg flows.

3.3.1 Domestic Flows

Domestic wastewater consists of the following categories:

- Domestic sources (residential and commercial).
- Minor industrial sources, which consist of 26 industries with a total combined flow averaging about 0.7 million gallons per day (mgd) (2013–2014 average).
- Major non-Can Seg industrial sources, which consist of 12 industries with a total combined flow averaging 1.5 mgd (2012–2014 average).

Flows from the minor industries have characteristics similar to domestic wastewater from residents, whereas major industrial flows have higher concentrations of organic constituents than typical domestic flows. Nonetheless, for this report, flows from minor industries, major industries, and residential sources will be collectively referred to as "domestic" flows. Projected domestic flows and loadings are summarized in Table 2.

3.3.2 Can Seg Flows

Can Seg flows consist of process water from canneries and food processors. The Can Seg Line (CSL) conveys these flows separately to ranch land at the Jennings Plant, where they are combined with secondary effluent and used for irrigation. During the non-canning season, process flows from year-round food processors are combined with the influent wastewater at the Sutter Plant and treated with domestic flows. However, as previously mentioned, after improvements are made to the secondary treatment system at the Jennings Plant, this practice will be discontinued and Can Seg flows will be processed solely at the Jennings Plant.

Table 2	Domestic Wastewater Flows Engineer's Report City of Modesto, California		
Parameter	**Units**	**Current[1,2] (2015)**	**Projected[1,2] (2035)**
Average			
Flow (AAF)	mgd	18.5	24.9
BOD	mg/L	340	360
BOD	ppd	52,300	75,800
TSS	mg/L	310	320
TSS	ppd	48,500	66,400
Peak 30-Day			
Flow (MMF)	mgd	20.4	27.4
BOD	mg/L	400	430
BOD	ppd	68,200	98,700
TSS	mg/L	420	430
TSS	ppd	72,200	99,000
Peak Hour			
Dry Weather Flow (PDWF)	mgd	36.5	48.6
Wet Weather Flow (PWWF)	mgd	70.7	93.7

Notes:
(1) This is the total flow to the domestic collection system, including domestic, minor industrial, and major non-Can Seg industrial flows. This information is from the draft Wastewater Treatment Master Plan (Carollo 2016).
(2) The loadings in pounds per day were rounded to the nearest hundred. The concentrations were rounded to the nearest ten.

Projected Can Seg flows and loadings are summarized in Table 3.

Table 3	Can Seg Water Flows and Loadings Engineer's Report City of Modesto, California				
		Current (2015)		**Projected Canning Season**	
Parameter	**Units**	**Non-Canning Season[1,2]**	**Canning Season[1,2]**	**Additional Treatment Capacity[1,2,3]**	**Total[1,2]**
Average					
Flow (AAF)	mgd	1.60	14.8		
BOD	mg/L	1,510	2,450		
BOD	ppd	20,200	301,000		
TSS	mg/L	310	880		
TSS	ppd	4,200	108,000		
Peak 30-Day					
Flow (MMF)	mgd	1.77	20.3	5	25.3
BOD	mg/L	1,760	2,620	2,620	2,620
BOD	ppd	26,100	444,000	109,000	553,000
TSS	mg/L	470	840	840	840
TSS	ppd	6,900	143,000	35,000	178,000

Notes:
(1) From the draft Wastewater Treatment Master Plan (Carollo 2016).
(2) The loadings in pounds per day were rounded to the nearest hundred. The concentrations were rounded to the nearest ten.
(3) The Secondary Treatment/Can Seg Treatment Facilities upgrade project will provide treatment capacity for 5 mgd of Can Seg flow at the peak 30-day loadings. These upgrades are scheduled to be completed at the end of 2019.

4.0 JUSTIFICATION FOR COLLECTION SYSTEM IMPROVEMENTS

The 2016 Master Plan has identified necessary wastewater collection system improvements over the next 20 years to the year 2035. These improvements are categorized below.

- **Capacity Improvements:** Capacity improvements include either replacing existing trunk sewers or pump stations or adding new trunk sewers or pump stations to adequately convey current PWWFs. As growth continues and more users contribute to the system, flow will increase. This will, in some cases, create additional capacity deficiencies. Therefore, the existing collection system was also evaluated to identify flow capacity deficiencies during peak flow conditions at build-out of the service area. Projects identified for these conditions are considered capacity related and are not considered an expansion of the system to connect future users.

- **New Growth Improvements:** These include new pump stations and/or extensions of existing trunk sewers to serve new customers.

- **Rehabilitation and Replacement (R&R) Improvements:** These include improvements to the existing trunk sewers or pump stations to extend their useful lives, repair structural deficiencies, and/or improve performance for adequate capacity throughout the planning period.

- **Reliability Improvements:** These include adding parallel sewers where existing sewers cross below major obstacles and prevent access. The sewer crossing below Highway 99 is an example of this.

- **Storm Drain Cross Connection Removal:** Currently, the City has 60 known storm drain cross connection where storm water runoff discharges to the sanitary sewer system. On the basis of discussions with the City, Carollo developed the hydraulic model, capacity evaluation, and proposed improvements assuming these connections will be removed in the future.

Justifications for capital improvement projects for the wastewater collection system are provided in the following sections. The recommended collection system projects are shown on Figure 3 and listed in Appendix A. Table 4 summarizes the cost for each project category, which is then described in the following sections.

The estimated costs are in 2015 dollars and are referenced to the 20-City Average Engineering News Record Construction Cost Index (ENR CCI) of 10037 (July 2015). Construction costs include a 25 percent estimating contingency. Project costs include construction costs and a 30 percent allowance for engineering, legal, and administration costs.

Table 4 Collection System Capital Cost Summary by Project Type Engineer's Report City of Modesto, California	
Improvement Type	**Total Project Cost[(1)]**
Capacity Improvements	$103.6
New Growth Improvements	$35.4
R&R Improvements	$56.0
Reliability Improvements	$5.6
Storm Drain Removal	$17.0
Total	**$217.7**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, and administration costs.

4.1.1 Capacity Improvement Projects

4.1.1.1 Assumptions and Criteria

According to the design criteria established in the Master Plan, gravity sewers must be able to convey PWWFs while maintaining a maximum flow depth to pipe diameter (d/D) ratio of 0.85. In other words, the sewers should not be more than 85 percent full during PWWF conditions. The collection system lift stations must also be able to reliably pump PWWF. This means that pump station capacity should meet the standards of "firm capacity," which is the pumping capacity with the largest pump out of service.

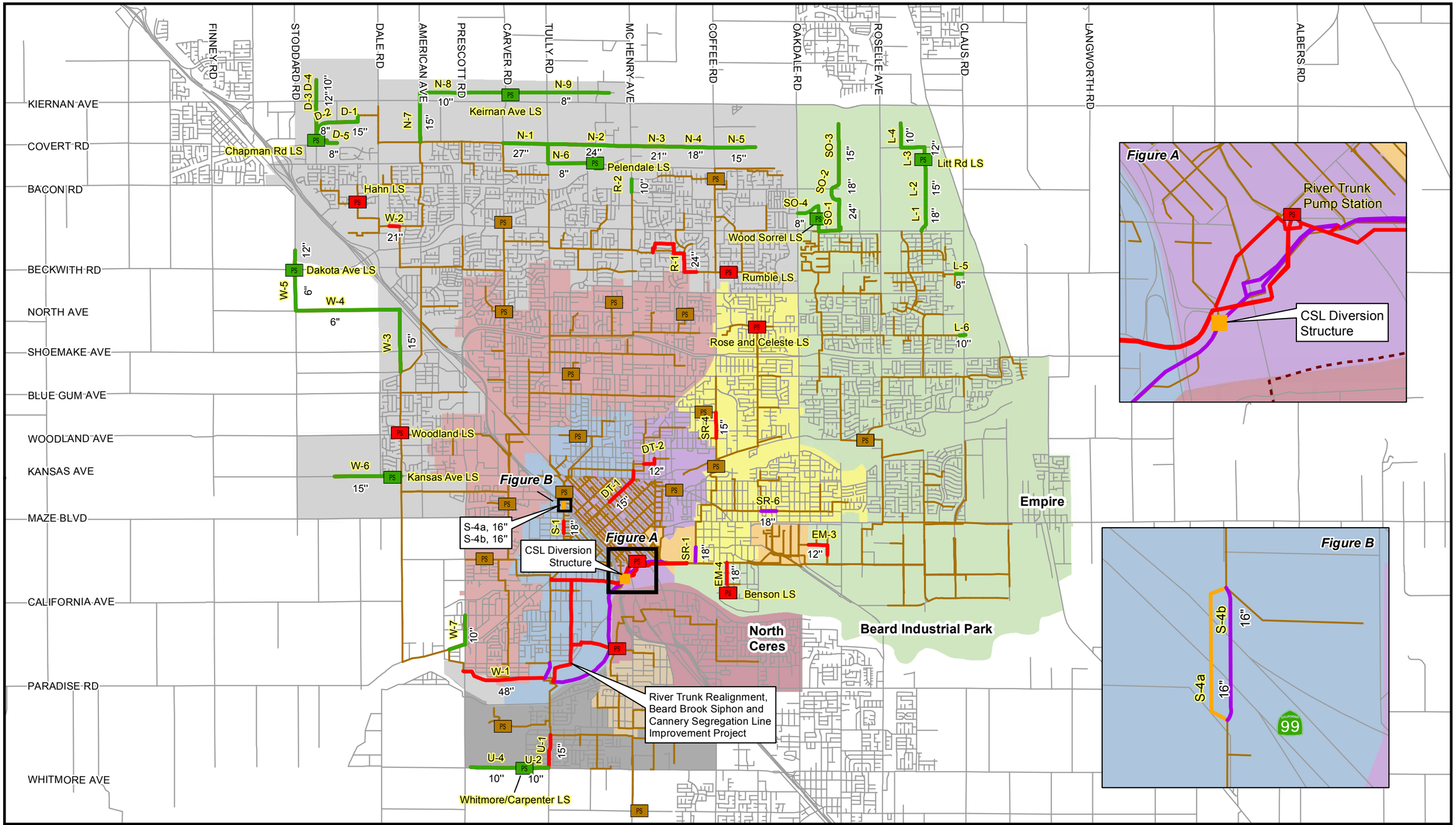
The hydraulic model developed for the Master Plan simulated peak flows during a 10-year, 24-hour storm. This model identified both pipeline sections that exceeded the maximum allowable d/D criteria of 0.85 as well as lift stations that lacked sufficient firm capacity.

4.1.1.2 Improvements for Current PWWF Conditions

The following sections summarize recommended improvements to accommodate PWWFs under current conditions. For each tributary area's designated area number, refer to Figure 3.

4.1.1.2.1 Area 1

- **Hahn Lift Station (Project LS 19):** Improvements to this lift station are currently under design to increase the firm capacity from 0.65 mgd to 1.3 mgd. The two existing pumps will be replaced with two 900-gpm pumps. In addition, the station will be relocated from the southwest corner of Nightingale Drive and Honey Creek Road to the southeast corner.



Legend

- Capacity Pump Station Improvements
- Capacity Pipeline Improvements
- New Service Pump Station Improvements
- New Service Pipeline Improvements
- Rehabilitation Pipeline Improvements
- Reliability Pipeline Improvements
- Existing Lift Station
- Existing Pipelines

Tributary Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6
- Area 7
- Area 8/Northern Ceres
- Area 9
- Area 10

Source: Collection System Master Plan

carollo

0 4,000 8,000 Feet

COLLECTION SYSTEM IMPROVEMENTS

FIGURE 3

CITY OF MODESTO
ENGINEERS REPORT

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- **Rumble Lift Station (Project LS 30):** The Rumble Lift Station is located on Rumble Road near Bay Lane. The two existing 950-gpm pumps will be replaced with larger pumps to increase the pumping capacity from 1.37 mgd to 2.33 mgd.

4.1.1.2.2 Area 3

Major projects recommended for Area 3 include the River Trunk Realignment and the River Trunk Pump Station. In 2015, the City completed a Preliminary Design Report (PDR) for improvements to bypass the capacity constraints in the River Trunk and eliminate the inverted siphons at the Dry Creek crossing near the Gallo property. These projects will consist of a new alignment for the gravity flow section of the River Trunk and a new River Trunk pump station.

The projects in Area 3 are described below.

- **48-inch Gravity Sewer along Tuolumne Blvd (Project RT-1):** This project consists of 2,300 feet of 48-inch diameter gravity sewer in Tuolumne Boulevard between Neece Drive and Colorado Avenue. This segment will convey flow from the River Trunk Pump Station force mains to a new 54-inch gravity diameter sewer along Colorado Avenue.

- **54-inch Gravity Sewer along Colorado Ave (Project RT-2):** The pipeline will be located in Colorado Boulevard between Tuolumne Boulevard and Pelton Avenue. Flows from the River Trunk and Sutter Trunk will combine at the intersection of Tuolumne and Colorado and continue south to the Sutter Plant. The total length of the sewer will be 4,000 feet.

- **Gravity Sewer along Colorado Ave to Sutter Plant (Project RT-3):** This project adds a gravity sewer ranging from 60 inches to 84 inches in diameter. The sewer will extend 3,300 feet south along Colorado Avenue and terminate at the Sutter Plant. It will convey flows from the River Trunk, Sutter Trunk, and Shakelford Pump Station.

- **21-inch Gravity Sewer along Tuolumne Blvd (Project RT-4):** This project will relieve PWWFs from the Sutter Trunk to the River Trunk. It consists of 1,300 feet of 21-inch diameter pipeline in Tuolumne Boulevard that will connect to the new River Trunk at Colorado Boulevard.

- **Dual Force Mains along Tuolumne Blvd (Project RT-5):** This project adds new parallel 30-inch and 42-inch diameter force mains that will convey flow pumped from the River Trunk Pump Station to a discharge structure in Tuolumne Boulevard. At the structure, flow will transition from pumped flow to gravity flow. The two new force mains will be 2,600 feet long.

- **Beard Brook North Gravity Alignment (Project RT-6):** This project will replace the existing Beard Brook Siphon with a 48-inch diameter gravity pipeline. The new

pipeline will run from west of Beard Brook Park to the River Trunk Pump Station and will cover a distance of 3,900 feet. This project will eliminate the need for an inverted siphon under Dry Creek and address maintenance and odor issues associated with the siphon.

- **36-inch and 48-inch Gravity Sewer from B St to Pumping Station (Project RT-7):** This project adds 36-inch and 48-inch gravity sewers that will run from Calaveras Street to the inlet of the River Trunk Pump Station. They will cover a distance of 1,500 feet.

- **14-inch Shackelford Force Main and 18-inch Gravity Sewer (Project RT-8):** This project adds a 14-inch diameter force main that will convey flows from the new Shackelford pump station beneath the Tuolumne River. The new force main will be inserted in a recently completed inverted siphon under the Tuolumne River. Beyond the crossing, the force main will continue north through the Dryden Park Golf Course and terminate at an 18-inch diameter gravity pipeline in Roselawn Avenue. Flows will be conveyed to the River Trunk at Colorado and Pelton.

- **Shackelford Pump Station:** This pump station will pump flows through a new force main under the Tuolumne River and discharge into the River Trunk. It will be expanded to provide a firm capacity of 4.2 mgd.

- **River Trunk Pump Station:** This pump station will allow the River Trunk to be moved from the Tuolumne River bank, which is susceptible to erosion and flooding during high river flows. The pump station's pumping capacity will be 54.5 mgd.

4.1.1.2.3 Area 4

- **Downtown Trunk (Project DT-1):** Flow levels in the 12-inch trunk sewer in J Street cause the pipeline to surcharge, meaning the flow exceeds the crown of the pipe. Therefore, the pipeline will be replaced with a new 15-inch diameter pipeline extending approximately 2,400 feet from McHenry Avenue to 12th Street.

- **Downtown Trunk (Project DT-2):** PWWFs in the existing 10-inch diameter pipelines in Kimble Street and Floto Street result in a d/D of 0.90, which exceeds the maximum d/D criteria of 0.85. These pipelines will be replaced with approximately 1,000 feet of 12-inch diameter pipeline.

4.1.1.2.4 Area 5

- **Santa Rosa Trunk (Project SR-4):** The flow level in the existing 10-inch diameter pipelines in Coffee Road between Fairmont Avenue and Lucern Avenue exceeds the maximum d/D criteria under PWWF conditions, which causes the pipeline to surcharge above the crown. Accordingly, the pipeline will be replaced with 1,600 feet of new 15-inch diameter pipeline.

- **Rose and Celeste Lift Station (Project LS 29):** The existing Rose and Celeste Lift Station is located on Rose Avenue and Celeste Drive. This project will increase the firm capacity from 0.86 mgd to 1.3 mgd to accommodate PWWFs.

4.1.1.2.5 Area 6

- **Empire Trunk (Project EM-3):** This project will replace the existing 10-inch diameter pipeline in Hoover Avenue and Doherty Avenue with approximately 1,800 feet of 12-inch diameter pipeline. This improvement is required because the flow level under PWWF conditions is at 95 percent full, which exceeds the design d/D.

- **Empire Trunk (Project EM-4):** The flow level in the 15-inch diameter trunk in Benson Avenue between Monterey Avenue and Oregon Drive reaches 93 percent capacity under PWWF conditions. The existing pipeline will be replaced with 1,400 feet of 18-inch diameter pipeline.

- **Benson Lift Station (Project LS 03):** The existing Benson Lift Station is located on Benson Avenue between Hillside Drive and Trenary Way. This project will increase the firm capacity from 0.22 mgd to 1.3 mgd to provide reliable capacity for current and future PWWFs.

4.1.1.3 Improvements for Future PWWF Conditions

The following sections summarize recommended improvements to accommodate PWWFs at build-out of the service area.

4.1.1.3.1 Area 1

- **West Trunk (Project W-1):** At build-out of Area 1, the increased flow from new growth and infill will cause flow levels in the lower reach of the West Trunk to exceed the maximum depth criteria. The deficient pipelines extend 5,300 feet and range from 54 inches to 60 inches in diameter. To increase capacity within this reach, a new parallel 48-inch diameter pipeline will be added, extending 5,200 feet from Carpenter Road to Sutter Plant. The project will not be required until Area 1 is built-out.

- **West Trunk (Project W-2):** Future PWWFs in the 18-inch diameter trunk in Veneman Avenue, located between Hahn Drive and Dale Road, will exceed the maximum depth criteria. To mitigate the deficiency, the pipeline will be replaced with 650 feet of 21-inch diameter pipeline.

- **Woodland Lift Station (Project LS 39):** The firm capacity of the Woodland Lift Station, located near the Woodland Avenue and Poust Road intersection, lacks sufficient capacity for the PWWFs at build out. Accordingly, its firm capacity will be expanded from 20.9 mgd to 25.2 mgd.

- **Rumble Trunk (Project R-1):** The flow depth in the Rumble Trunk from Rumble Road to Maud Kump Terrace will exceed the maximum depth criteria at build-out. Currently, this project is in the planning phase and will replace 4,200 feet of existing 21-inch diameter pipeline from Claremont Avenue to Don Caster Lane with 5,100 feet of 24-inch diameter pipeline. A portion of the existing pipeline alignment is in an alley and will be abandoned. The new alignment will continue north to Barringham Lane and connect to the existing system in Don Caster Lane.

4.1.1.3.2 Area 3

- **Sutter Trunk (Project S-1):** The existing 16-inch diameter trunk in Jefferson Avenue between Maze Boulevard and Oak Street will exceed the maximum depth criteria. This project will replace the existing pipeline with 760 feet of 18-inch diameter pipeline.

4.1.1.3.3 Area 10

- **Ustick Trunk (Project U-1):** New growth in Area 10 will cause the Ustick Trunk to surcharge. The 12-inch diameter pipeline, extending from Whitmore Avenue to Imperial Avenue, will be replaced with 2,100 feet of 15-inch diameter pipeline.

4.1.2 New Growth Improvement Projects

The projects described below are required to extend existing trunk sewers and/or add new pump stations to serve new customers.

4.1.2.1 Area 1

- **West Trunk (Projects W-3 through W-5 and Dakota Avenue LS 64):** These projects are recommended to serve future growth within the Beckwith-Dakota and College West comprehensive planning districts (CPDs). In this area, a new lift station and force main will be required. The force main will convey flow from the lift station to the existing West Trunk on the west side of Highway. The project consists of the following segments:
  - Project W-3 consists of 4,000 feet of 15-inch diameter pipeline from North Avenue to McDonald Avenue, which is where the pipeline will connect to the West Trunk.
  - Project W-4 consists of 9,000 feet of 6-inch diameter force main to connect LS 64 to Project W-3. The force main will be aligned down Dakota Avenue and North Avenue.
  - Project W-5 consists of 1,200 feet of 12-inch diameter pipeline in Dakota Avenue to LS 64. LS 64 will have a firm capacity of 0.5 mgd.

- **West Trunk (Projects W-6 and Kansas Avenue LS 63):** These improvements will service future growth within the Highway 132 CPD. Project W-6 consists of a 4,300-ft

long, 15-inch diameter pipeline that will connect to the West Trunk. Lift Station 63 will convey future flows from the Highway 132 CPD and will have a firm capacity of 1.0 mgd.

- **West Trunk (Project W-7):** This project consists of 2,900 feet of 10-inch diameter pipeline in Carpenter Road and Paradise Road. The project will extend the area served by the West Trunk to include existing county islands in the City's southwest section.

- **Rumble Trunk (Project R-2):** This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD. This project extends the sub trunk on McHenry Avenue 900 feet with a 10-inch diameter pipeline from Grecian Avenue to the existing sewer at the intersection of McHenry and Coralwood Road.

- **Dale Trunk (Projects D-1 through D-5 and Chapman Road LS 60):** These projects will service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs, which was previously discussed in the 2007 Master Plan as a separate study (Kaiser Hospital Special Study, August 2004). It has since been incorporated into the current Master Plan, except that the pipeline diameter recommended in the 2007 Master Plan has been reduced due to lower projected flows. Improvements to the Dale Trunk will consist of a lift station, force main, and gravity pipelines. The project consists of the following segments:
  - Segment D-1 is located in undeveloped land west of Kaiser Permanente and consists of 1,200 feet of 15-inch diameter pipeline.
  - Segment D-2 continues across undeveloped land between Chapman Road and Quinturn Lane. This segment will consist of 2,600 feet of 6-inch diameter force main.
  - Segment D-3 consists of 1,700 feet of 12-inch diameter pipeline in Chapman Road between Kiernan Avenue and a Modesto Irrigation District (MID) Canal.
  - Segment D-4 consists of 2,200 feet of 10-inch diameter pipeline in Chapman Road from Kiernan Avenue to south of Pirrone Road.
  - Segment D-5 runs parallel to an MID canal and is currently in undeveloped space. This reach will consist of 1,500 feet of 8-inch diameter pipeline.
  - The Chapman Road Lift Station (LS 60) will have a firm capacity of 0.80 mgd to convey flows from the Kiernan/Carver and Kiernan/Carver North CPDs.

- **North Trunk (Projects N-1 through N-5):** Future development within the Kiernan/Carver, Kiernan/McHenry, Pelandale/McHenry, and Hetch Hetchy CPDs will require the construction of several trunk sewers to serve customers in the northern portion of the study area. The North Trunk is a tributary of the West Trunk.

  The 2007 Master Plan proposed the construction of a large trunk sewer in Bangs Avenue from Carver Road to east of Coffee Road, which is shown in Figure 6.4. For

the current Master Plan, this alignment was not changed, but the pipeline diameters were decreased due to reduced estimated future flows. The proposed improvements will extend the North Trunk into the Hetch Hetchy CPD. The North Trunk project consists of the following segments:

  - Segment N-1 consists of 2,800 feet of 27-inch diameter pipeline in Bangs Avenue between Tully Road and Carver Road.
  - Segment N-2 consists of 6,100 feet of 24-inch diameter pipeline along Bangs Avenue from McHenry Avenue to Tully Road.
  - Segment N-3 continues across undeveloped land from an MID canal to McHenry Road. This reach will consist of 1,600 feet of 21-inch diameter pipeline.
  - Segment N-4 consists of 3,100 feet of 18-inch diameter pipeline in undeveloped land from Coffee Road to an MID Canal.
  - Segment N-5 consists of 2,400 feet of 15-inch diameter pipeline in undeveloped land from east of Oakdale Road to Coffee Road.

- **North Trunk (Project N-6 and Pelandale LS 59):** This project is recommended under the Pelandale/McHenry Specific Plan (Final, June 2006), which identified facilities needed to service future growth within the Pelandale/McHenry CPD. The project includes a lift station and a 10-inch trunk within Pelandale Avenue and Tully Road. This lift station will pump flow under the MID Lateral Canal No. 6 and will have a firm capacity of 0.14 mgd. The 10-inch diameter pipeline will extend approximately 4,800 feet and connect to the existing sewer in Bangs Avenue.

- **North Trunk (Projects N-7 through N-9 and Kiernan LS 65):** Future development within the Kiernan/Carver North CPD will require the construction of several trunk sewers and a lift station to serve future users. This project is separated into the following segments:

  - Segment N-7 consists of 2,600 feet of 15-inch diameter pipeline located in American Avenue between Kiernan Avenue and Bangs Avenue.
  - Segment N-8 consists 5,600 feet of 10-inch diameter pipeline along Kiernan Road from American Avenue to Carver Road.
  - Segment N-9 continues in Kiernan Avenue between Carver Road and Stratos Way and consists of 6,300 feet of 8-inch diameter pipeline.
  - The Kiernan Avenue Lift Station (LS 65) will have a firm capacity of 0.24 mgd to convey PWWF from the Kiernan/Carver North CPD.

4.1.2.2 Area 6

- **Sonoma Trunk Extension (Projects SO-1 through SO-4 and Wood Sorrel LS 61):** These improvements have incorporated and modified future recommendations from the 2007 Master Plan to extend the Sonoma Trunk to the Roselle-Claribel CPD.

This project will extend the Sonoma Trunk to service future growth. The following segments are included:

- Segment SO-1 consists of 3,300 feet of 24-inch diameter pipeline that connects to an existing 27-inch diameter trunk. The proposed trunk will continue west in Sylvan Avenue and then north along an unimproved road.
- Segment SO-2 is an 18-inch diameter pipeline that extends 2,600 feet from Segment SO-1 to an area north of Mabel Avenue.
- Segment SO-3 consists of 2,800 feet of 15-inch diameter pipeline that extends from Segment SO-2 to an area south of Claribel Road.
- Segment SO-4 consists of 3,100 feet of 8-inch diameter pipeline that will convey flows from the southwest area of the Rose Claribel CPD. The 8-inch diameter pipeline will extend north from an existing 27-inch diameter sewer in Wood Sorrel Drive.
- The Wood Sorrel Drive Lift Station (LS 61) will have a firm capacity of 0.07 mgd.

- **Lakewood Trunk Extension (Projects L-1 through L-4 and LS 67):** Currently, the existing trunk is stubbed and plugged at the intersection of Litt Road and Sylvan Avenue. The Lakewood Trunk extension will service the eastern half of the Roselle-Claribel CPD. This project consists of the following segments:
  - Segment L-1 is located in Litt Road and extends from the end of Lakewood Trunk at Sylvan Avenue. This reach will consist of 2,900 feet of 18-inch diameter pipeline.
  - Segment L-2 continues in Litt Road and consists of 1,700 feet of 15-inch diameter pipeline.
  - Segment L-3 consists of 800 feet of 12-inch diameter pipeline that begins in Plainview Road and runs in Litt Road.
  - Segment L-4 consists of a 10-inch diameter pipeline that extends 3,000 feet from south of Claribel Road to Plainview Road.
  - The Litt Road Lift Station (LS 67) will have a firm capacity of 0.64 mgd.

- **Lakewood Sub-trunks (projects L-5 and L-6):** This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD. Project L-5 will extend from an existing 15-inch diameter pipeline, located at the intersection of Ruffed Goose Lane and Crested Bobwhite Street, within the Falling Leaf Subdivision. The existing pipeline will extend east beyond the development and will stub in an undeveloped area. A proposed 8-inch diameter pipeline will extend 220 feet and terminate in Claus Road. Project L-6 is a 10-inch diameter pipeline that will extend the existing subtrunk in Merle Avenue to serve future growth.

4.1.2.3 Area 10

- **Ustick Sub-Trunks and Lift Station (Projects U-2 through U-4 and LS 62):** This group of improvements will service commercial and residential growth within the Fairview CPD. This project consists of three segments and a lift station, which are described below:
  - Segment U-2 consists of 3,400 feet of 10-inch diameter pipeline in Whitmore Avenue from Tuscan Avenue to Ustick Road.
  - Segment U-3 consists of 400 feet of 4-inch force main in Whitmore Avenue from Yuma Avenue to west of Tuscan Avenue. The force main will allow the proposed 10-inch diameter sewer (Segment U-2) to connect with the existing pipeline in Ustick Road.
  - Segment U-4 continues in Whitmore Avenue and extends from Carpenter Road to the proposed lift station near Yuma Avenue. This reach consists of 3,400 feet of 10-inch diameter pipeline.
  - The lift station at Whitmore and Carpenter Lift Station (LS 62) will have a firm capacity of 0.4 mgd.

4.1.3 Rehabilitation and Replacement Improvement Projects

It is recommended that the City rehabilitate existing trunk sewers and lift stations to extend the lives of these facilities for existing and future users and to improve operational reliability. These projects are described below.

- **Rehabilitation and Replacement (R&R) Program:** The City will implement an R&R program either to replace sewer pipelines susceptible to failure or to line corroded pipelines. This program will target small diameter pipelines and large diameter sewer mains throughout the City. Funding will be at a rate of $3.0 million per year for the first five years and will decrease to $1.67 million per year thereafter.

- **Sutter Trunk (Project S-4b):** This project will rehabilitate 400 feet of the existing 16-inch diameter pipeline under Highway 99 near Jefferson Street. Prior to implementing this project, a permanent parallel sewer (Project S-4a) will be constructed as a bypass.

4.1.3.1 Area 3

- **24-inch Rehabilitation along Sutter Trunk (Project RT-9):** Based on the results of the condition assessment, a portion of the Sutter Trunk will require rehabilitation directly upstream of the Sutter Plant. The recommended approach is to add cured-in-place pipe lining. Since much of the pipeline's interior is inaccessible for a condition assessment, it is assumed that half of the pipeline's length will be lined.

- **48-inch River Trunk Rehabilitation (Project RT-10):** Excessive corrosion is present in the entire reach of the River Trunk from Beard Brook to the Sutter Plant. For this reason, rehabilitation is recommended within the next five years.

4.1.3.2 Area 5

- **Santa Rosa Trunk (Project SR-1):** This project will rehabilitate 1,300 feet of the 30-inch diameter and 400 feet of the 24-inch diameter pipeline within Santa Rosa Avenue between Organ Drive and Mono Drive.

- **Santa Rosa Trunk (Project SR-6):** This segment of the Santa Rosa Trunk in Miller Road between Conejo Avenue and Phoenix Avenue is over 50 years old and shows signs of significant deterioration. This project will rehabilitate 1,000 feet of the 18-inch diameter pipeline.

4.1.4 Reliability Improvement Projects

It is recommended that the City construct parallel pipelines where the collection system crosses Highway 99. This would increase reliability and allow the existing pipeline to be rehabilitated without disrupting service. These projects are described below.

4.1.4.1 Area 2

- **Sutter Trunk (Project S-4a):** This project will construct a parallel pipeline under Highway 99 near Jefferson Street. The parallel sewer line will consist of 400 feet of 16-inch diameter pipeline and will serve as a bypass when rehabilitating the existing sewer. In addition, the sewer line will provide a redundant pipeline under Highway 99.

4.1.4.2 Area 3

- **River Bank Armament (Project RT-11):** Riverbank armament is required to prevent future erosion and exposure of the River Trunk and the CSL.

- **CSL Diversion Structure (Project RT-12):** This project is a new diversion structure that will divert flows between the CSL and the existing River Trunk if a pipeline fails. This project provides reliability to the CSL and River Trunk.

4.1.5 Storm Drain Cross Connection Removal Program

For areas of the City lacking storm drainage systems, storm water is conveyed into the sanitary sewer system via cross connections. However, removing some of these cross connections is necessary to reduce the amount of storm run-off that enters the sewer system. This is because increased storm run-off in a system increases the risk of sanitary sewer overflow.

Currently, the City has planned to remove three cross connections located downtown, one cross connection at Hahn Sewer Lift Station, and four cross connections in the Roosevelt

Park neighborhood. In the next 5 years, it is estimated that up to eight more cross connections could be removed City-wide. The remaining cross connections would be removed between years 2021 and 2035.

5.0 JUSTIFICATION OF WASTEWATER TREATMENT IMPROVEMENTS

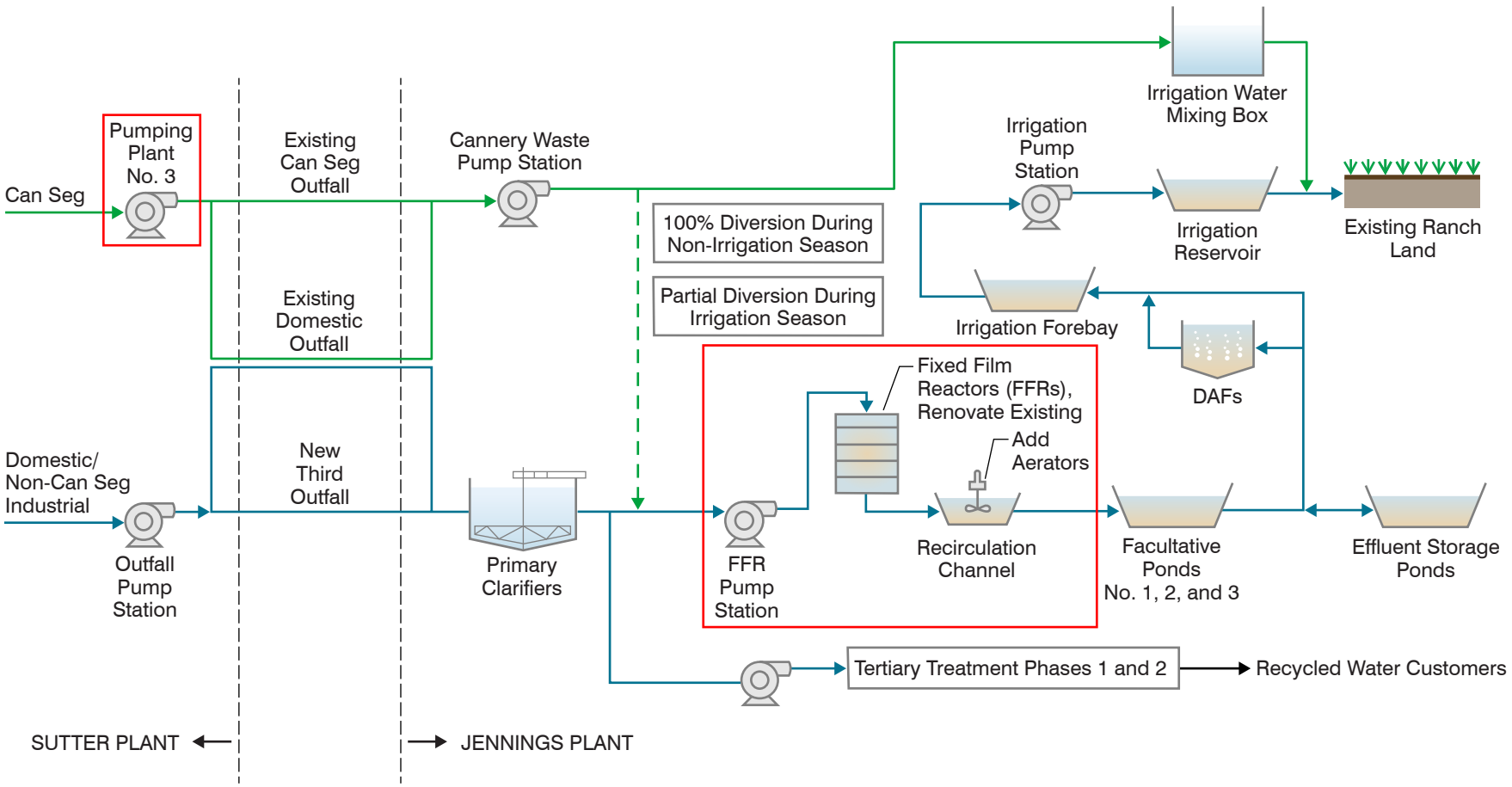
Per the 2016 Master Plan, improvements to the wastewater treatment facilities are recommended to improve reliability, to provide an increased level of treatment, and to increase treatment capacity to accommodate growth.

The recommended projects consist of the following components, which are described below.

- **Sutter Plant Improvements:** These improvements expand the Sutter Plant's hydraulic capacity and decommission abandoned facilities.
- **Outfall Pipelines:** This part of the project constructs a third outfall and new river crossings for the Domestic Outfall and Can Seg Outfall. It also adds slip lining to a portion of the Can Seg Outfall.
- **Can Seg Flow Treatment Improvements:** These improvements include upgrading the existing secondary treatment facilities so that they can treat combined primary effluent and a portion of the Can Seg flows.
- **Primary Treatment at Jennings Plant:** This part of the project adds new primary treatment and solids handling facilities to the Jennings Plant.

Recommended projects and estimated costs are shown in Table 5, and additional details from the Wastewater Treatment Master Plan CIP are presented in Appendix B. The estimated costs are in 2015 dollars and are referenced to the 20-City Average Engineering News Record Construction Cost Index (ENR CCI) of 10270 (December 2015). Construction costs include a 30 percent estimating contingency. Project costs include construction costs and a 32 percent allowance for engineering, legal, administration, and permitting costs.

A schematic of the recommended project is shown in Figure 4. Site layouts for the Sutter Plant, Outfall Pipelines, and Jennings Plant are shown on Figures 5, 6, and 7, respectively.



LEGEND
Can Seg Flow
Domestic/Non-Can Seg Industrial Flow
Tertiary Effluent

NOTE:
Red Box – New/modified facilities during Phase 1 of CIP.

SCHEMATIC OF RECOMMENDED PROJECT

FIGURE 4

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan

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LEGEND

Facilities to be Demolished

Facility List:

1. Collection Storage Yard
2. Collection & Electrical
3. Admin & Lab Building
4. Water Well 15A
5. Overflow Parking
6. Crane Storage Building
7. Septic Receiving Station
8. Digester #1
9. Digester #2
10. Digester #3
11. Digester #4
12. Digester #5
13. Electrical Sub-Station 1
14. Ferric Chloride Station
15. Maintenance (Staff Building)
16. Maintenance (Shop Building)
17. Emergency Generator #1
18. Electrical Sub-Station 2
19. Pumping Plant No.3
20. Headworks
21. Air Handling Building
22. Odor Control Bio Filter
23. Sludge Thickener No. 1 (abandoned)
24. Sludge Thickener No. 2 (abandoned)
25. Gravity Belt Thickener Building
26. Polymer Mixing
27. Clarifier #1
28. Clarifier #2
29. Sludge Handling Building
30. Collection Storage Yard
31. Vac Con Dump Site
32. Water Well 15B
33. Aeration Basin/Holding Basin
34. Emergency Generator #2
35. Outfall Control Building
36. Solid Waste Storage
37. Outfall Pump Station
38. Outfall Control Valves
39. Emergency Holding Basin
40. Vactor Dump Station
41. Sludge Drying Beds

Kenneth St

Donald St

Hays St

John St

OUTFALL PUMP STATION

THIRD OUTFALL

84" PUMP STATION INFLUENT LINE

60" PUMP STATION EFFLUENT LINE

NOT PART OF SITE DECOMISSIONING

CONNECTION TO EXISTING DOMESTIC OUTFALL

EXISTING DOMESTIC OUTFALL

N

120 FEET

SUTTER PLANT SITE LAYOUT

FIGURE 5

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan

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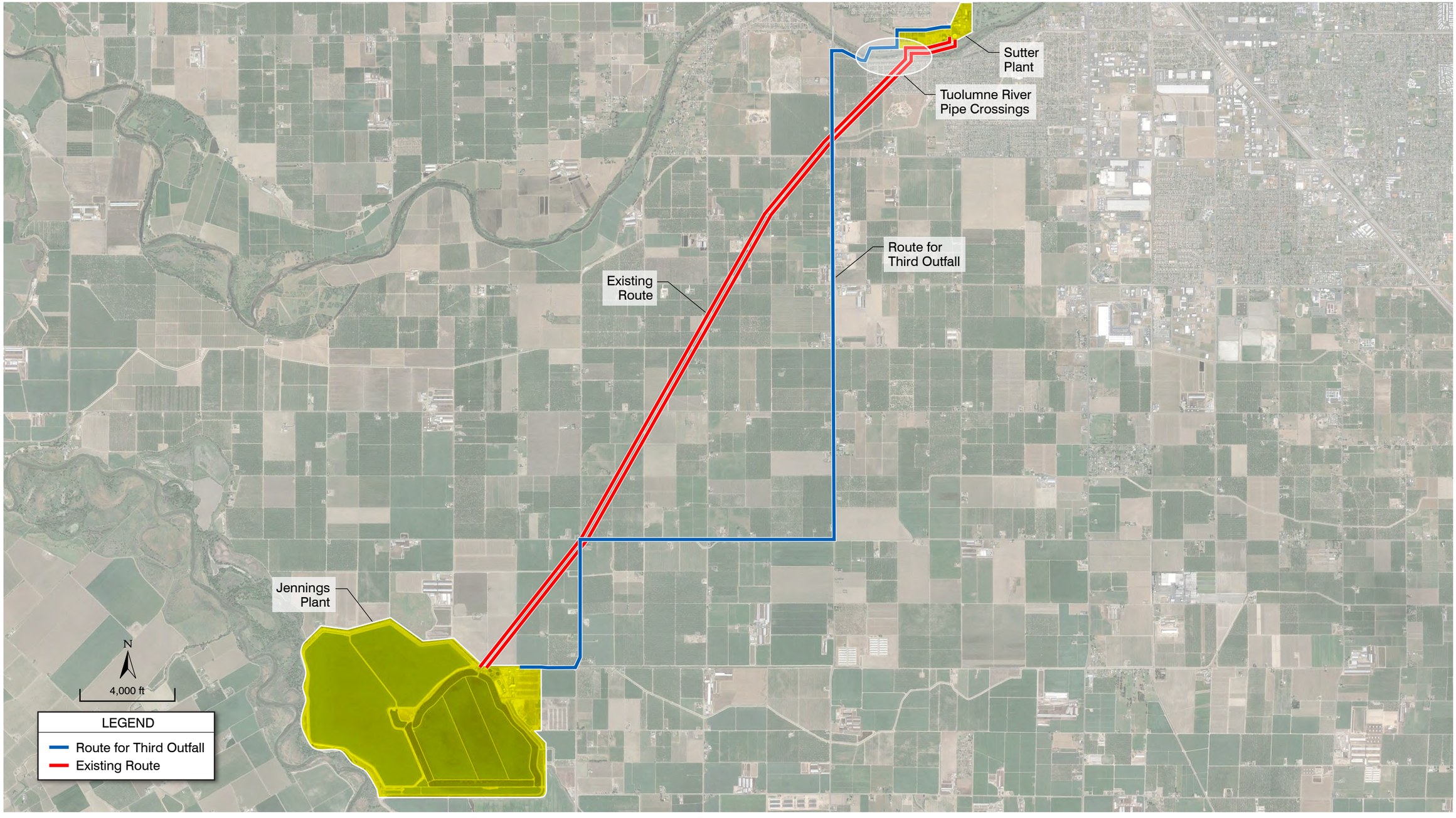

OUTFALL PIPELINES LAYOUT

FIGURE 6

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan

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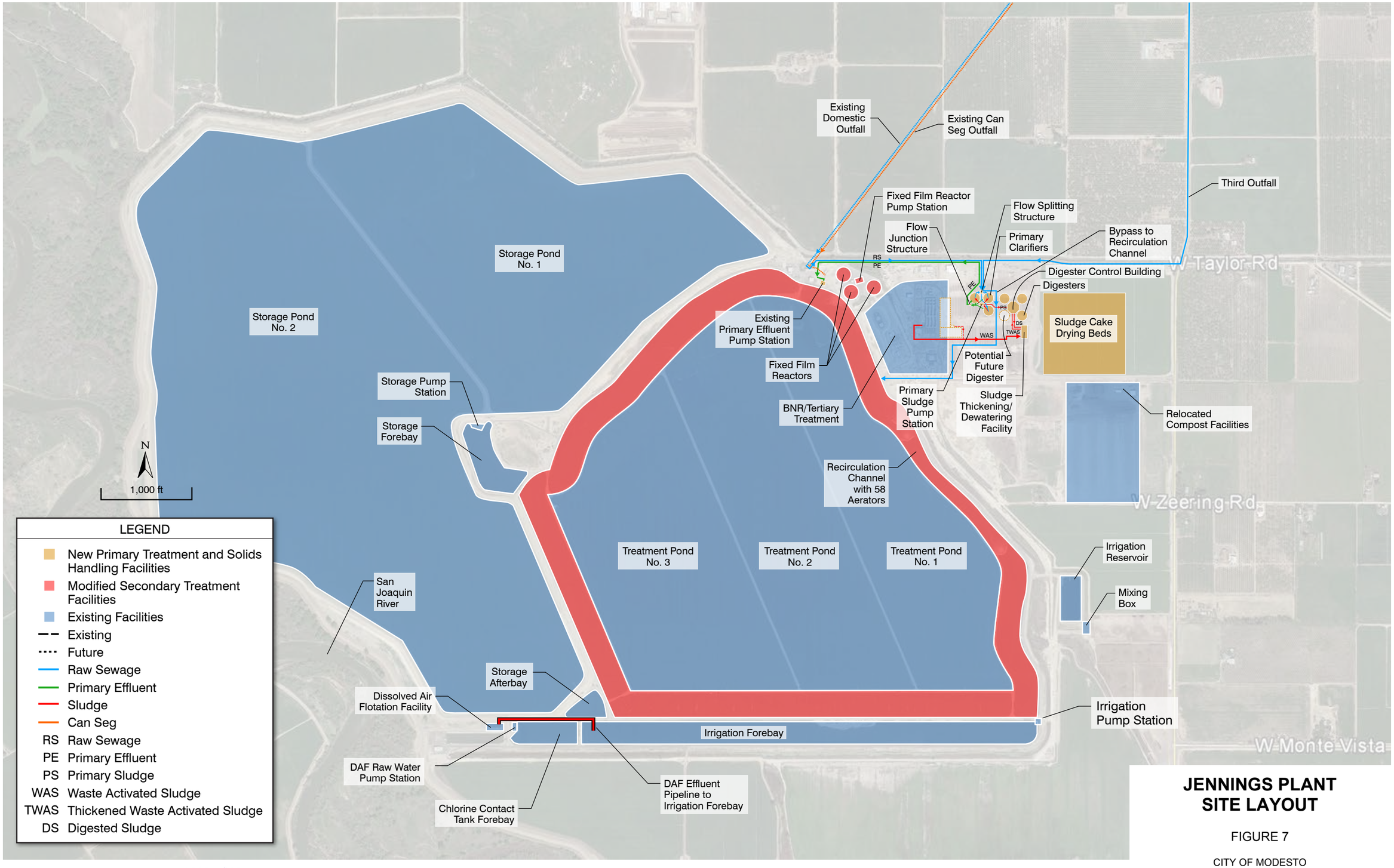

JENNINGS PLANT SITE LAYOUT

FIGURE 7

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan

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Table 5 Total Project Capital Costs for Recommended Project Engineer's Report City of Modesto, California	
Project Component	**Total Project Cost[(1)]**
Sutter Plant Improvements	
Influent Pump Station Improvements	$2.2
Headworks Improvements	$14.9
Outfall Pump Station Replacement	$17.3
Decommissioning of Abandoned Facilities	$4.9
Allowance for Flood Protection of Existing Sutter Facilities	$2.0
Subtotal for Sutter Plant	**$41.3**
Outfall Pipelines Improvements	
Tuolumne River Crossings	$26.0
Constructing a Third Outfall	$60.7
Slip Lining Portion of the Can Seg Outfall	$10.5
Subtotal for Outfall Pipelines	**$97.2**
Jennings Plant Improvements	
Secondary Treatment/Can Seg Treatment Facilities	$52.4
Primary Treatment and Solids Handling Facilities	$93.5
Miscellaneous Repairs	$0.9
Subtotal for Jennings Plant	**$146.8**
Engineering Studies	
Master Plan Updates	$2.0
Land Application Study	$0.3
Subtotal for Engineering Studies	**$2.3**
Total Project Capital Cost for Recommended Project	**$287.6**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, administration, and permitting costs.

The following sections describe the treatment and outfall pipeline projects.

5.1 Sutter Plant Improvements

5.1.1 SP - 1 Influent Pump Station Improvements

The influent pump station consists of four enclosed screw-type pumps as well as space planned for a fifth pump. Based on flow projections, the fifth pump will be required to provide sufficient capacity to convey the projected PWWF. However, this pump is not needed until near the end of the 20-year planning period.

5.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** The existing corroded Dryden Box will be demolished and replaced with a smaller box designed to receive and combine flow from the existing CSL and the old River Trunk. The River Trunk will be repurposed as a redundant CSL.

- **SP - 2.2 New West Junction Structure:** A new West Trunk Junction Structure will be constructed, and modifications to the existing Junction Box No. 1 will be made. This includes adding yard piping that connects the two structures to provide a connection point for the new River Trunk.

- **SP - 2.3 Influent Screening:** The influent bar screens will be replaced with new chain-driven multi-rake screens with 1/4-inch bar spacing. These new screens will improve efficiency and reduce maintenance on downstream treatment facilities. A 4-foot wide chain-driven multi-rake screen with 1/2-inch bar spacing will also be installed in the bypass channel, with 1-foot wide bypass gates on either side of the screen to divert peak flows. Additionally, a new screenings washer compactor will be skid-mounted and installed. The existing washer compactor will be removed, skid-mounted as well, and stored for standby use.

- **SP - 2.4 Grit Removal:** A grit removal mechanism will be installed in Grit Basin No. 4 along with an additional grit pump. Improvements to increase the capture of fine particles include placing deflector baffles on the inlets to the grit basins, raising the elevation of the grit chamber effluent weirs, and installing new motor belt drives to reduce the impeller speed in all four grit basins. Additionally, the existing cyclone/grit classifiers will be replaced with two COANDA vortex-type grit washers.

- **SP - 2.5 Headworks Building Odor Control Improvements:** In the Bar Screen Room and Building as well as the Grit and Screening Handling Room, the ventilation rate will be increased to improve working conditions. In addition, the existing air handling unit (AHU) will be replaced with two new AHUs, and the existing metal air ductwork from the AHU to the Headworks Building will be replaced with FRP ductwork.

  The existing biofilter consists of two cells with a 4-foot soil media bed. To accommodate increased ventilation airflows, this biofilter will be expanded into the space currently occupied by the access ramps.

- **SP - 2.6 Influent Parshall Flumes:** Upstream flow straightening baffles will be installed to even out the flow pattern upstream of the flumes and to improve measurement accuracy. The third standby flume will be brought online to accommodate projected PWWF.

- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** Pumping Plant No. 3 will be expanded to add a new wet well and submersible pumps dedicated to lower flows during non-canning season. Two small dry pit submersible pumps (4 mgd and 8 mgd) will be installed in the new wet well to improve turn-down capacity so that cannery process water can be segregated from domestic flows year-round. Additionally, the two existing Can Seg climber screens on the inlet channel to the existing Pumping Plant No. 3 will be replaced with new 3/8-inch chain-driven multi-rake type screens. A third screen will be installed in the existing bypass channel.

5.1.3 SP - 3 Outfall Pump Station Replacement

The existing Primary Effluent Pump Station will be replaced with a new Outfall Pump Station located above the 100-year flood elevation. This new pump station will provide the capacity and pumping head required for the projected PWWF.

5.1.4 SP - 4 Demolition of Sutter Treatment Facilities

After relocating the Primary Treatment and Solids Handling Facilities to the Jennings Plant, the abandoned facilities at the Sutter Plant will be demolished to below grade and buried to provide space for future facilities.

5.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

The facilities that remain at the Sutter Plant after relocating the Primary Treatment and Solids Handling Facilities will be modified to protect against a 100-year flood.

5.2 Outfall Pipelines Improvements

5.2.1 OP - 1 Replacement of Tuolumne River Pipe Crossings

- **OP - 1.1 Replacement of Existing Crossings:** For the Primary Domestic Outfall and Can Seg Outfall, the existing pipe crossings under the Tuolumne River will be replaced with new pipe crossings. The new crossings will allow the outfalls to operate under pressure and will increase their flow capacities. In addition, since the existing river crossings are likely in poor condition from corrosion, the new crossings will be designed with materials that prevent or delay corrosion and provide a long service life.

- **OP - 1.2 Crossing for Third Outfall.** A river crossing will also be provided for the new Third Domestic Outfall. For more on this, see CIP Project OP - 2.

5.2.2 OP - 2 Third Outfall

A new third outfall from the Sutter Plant to the Jennings Plant will be added to convey only domestic flows. The Third Outfall will have a 54-inch diameter and a length of

approximately 45,500 ft. This outfall will provide redundancy for the existing Domestic Outfall, which will allow it to provide redundancy for the Can Seg Outfall.

5.2.3 OP - 3 Slip Lining Portion of the Can Seg Outfall

A portion of the Can Seg Outfall will be lined with a plastic liner to improve its condition and reliability. Currently, the condition of the Can Seg Outfall interior is unknown. However, it is assumed that half of the pipeline's length will be lined. Nonetheless, the actual extent of the pipeline needing to be lined will be defined once the pipeline's condition is assessed.

5.3 Jennings Plant Improvements

5.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors (FFRs) and Pump Station Rehabilitation:** The existing FFR media, media support system, rotary distributor, and air supply fans will be replaced to increase the FFRs' performance. The pumps in the FFR Pump Station will also be replaced and equipped with variable frequency drives (VFDs) to meet minimum hydraulic loading requirements. In addition, the FFR Effluent Box will be expanded, and a new pipe will connect it to the existing pipeline from the Recirculation Diversion Box to the FFR Mixing Box. This will allow FFR effluent to be recirculated to the FFR influent instead of drawing make-up water from the Recirculation Channel.

- **JP - 1.2 Nutrient Feed and pH Control Systems:** Chemical feed pumps, storage tanks, and feed systems will be provided for each chemical. Nutrient addition and pH control of the Can Seg flow will be necessary for proper treatment process performance.

- **JP - 1.3 Peroxide Feed System:** Chemical feed pumps, storage tanks, and a feed system will be provided for peroxide to control odors from the FFRs.

- **JP - 1.4 Aerators in Recirculation Channel:** Fifty-eight 50-horsepower (hp) surface mechanical aerators, or another aeration system, will be installed in the Recirculation Channel to increase the secondary treatment capacity. A new electrical system, including transformers, motor control centers, and new ductbanks, will replace the mostly abandoned existing electrical service.

- **JP - 1.5 Dissolved Air Flotation (DAF) Piping Modifications:** The DAFs are used to remove algae and suspended solids from the pond effluent. The DAF effluent piping will be modified to convey the flow into the Irrigation Forebay. Flow from the Irrigation Forebay will then be used to irrigate the City's ranch land.

5.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities (Liquid Stream):** New Primary Treatment Facilities at the Jennings Plant will replace the aging Primary Treatment Facilities at the Sutter Plant. The new facilities will consist of three 110-foot diameter primary clarifiers, primary sludge pumping, and scum pumping.

- **JP - 2.2 Yard Piping and Structures:** Additional yard piping will be built to connect the primary treatment and solids handling facilities to the existing treatment facilities at the Jennings Plant. Flow splitting structures will also be provided.

- **JP - 2.3 Anaerobic Digesters:** Three anaerobic digesters will be built at the Jennings Plant to replace the aging digesters at the Sutter Plant and provide a means for treating the solids from waste activated sludge (WAS) generated by the BNR/tertiary facilities. Each digester will have a 115-foot diameter and a 31-foot side-water depth and will treat the combination of WAS and primary sludge from the new primary clarifiers. The digester complex will include a Digester Control Building to house electrical, instrumentation and control, digester mixing, and heating equipment.

- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities):** Two sieve drum concentrators will thicken the WAS before it is sent to the digesters. This thickening is necessary to reduce the volume requirements for the anaerobic digesters. After thickening, four belt filter presses, or another process, will dewater the digested sludge before it is sent to the sludge cake drying beds. The WAS thickening and biosolids dewatering equipment will be located in an enclosed building.

- **JP - 2.5 Sludge Cake Drying Beds:** Sludge cake (the dewatered digested sludge) will be solar-dried in new drying beds to reduce the volume and weight of the solids and treat it to Class I standards for land application at the City's ranch. The drying beds will consist of an asphalt-paved area with concrete containment walls and piping for drainage, as well as decant return to the existing tailwater pump station TPS-A. TPS-A will also be rehabilitated, and drying bed facilities will be constructed to accommodate additional flows.

5.3.3 JP - 3 Miscellaneous Repairs

The equipment at the Jennings Plant will require general replacement, and the existing facilities will need to be upgraded. Areas in need of repair include the Outfall Flowmeter Pit, FFR Mixing Box, Storage Pump Station, and DAF Facilities.

5.4 Engineering Studies

5.4.1 ES - 1 Master Plan Updates

The Master Plan will undergo an update every five years.

5.4.2 ES - 2 Land Application Study

The land application of cannery process water as irrigation water at current loadings is expected to continue for the duration of the planning period. However, a detailed scientific study is recommended to verify appropriate long-term land application rates and methodologies. If this study resulted in revised Waste Discharge Permit (WDR) requirements and loading rates, the requirements would likely be implemented over several five-year WDR permit cycles, which could continue beyond the 20-year planning period. For this reason, the CIP does not include projects to accommodate lower Can Seg land application rates.

6.0 COST ALLOCATION METHODOLOGY

This section describes the methodology used to allocate costs between existing and future domestic customers and Can Seg customers. Also described is the basis for cost allocations among the wastewater loading components, flow, biochemical oxygen demand (BOD), and total suspended solids (TSS).

6.1 Cost Allocations between Customers

6.1.1 Collection System Improvements

As discussed in Section 4.1, collection system improvements are categorized as capacity, new growth, rehabilitation and replacement (R&R), reliability, or storm drain cross connection removal. The methodology used to allocate costs for these categories is described below, and a summary of the collection system project cost allocations for each category is shown in Table 6. Detailed allocation criteria are presented in Appendix A.

6.1.1.1 Hydraulic Capacity Improvements

An existing hydraulic deficiency occurs where the flow levels in gravity sewers exceed the allowable d/D. A project to correct an existing hydraulic deficiency is allocated entirely to existing users.

An existing sewer or lift station may have sufficient capacity to convey current PWWFs, but as growth continues and more users are added to the system, flow will increase, resulting in capacity deficiencies. These projects, as well as new trunk sewers to extend wastewater collection system service to future growth areas, are considered future improvements and are allocated to future users.

Table 6 Allocation of Collection System Costs to Existing and Future Users Engineer's Report City of Modesto, California					
	Total Project Cost[(1)]	Cost Allocation[(1)]			
		Existing Customers		Future Customers	
Project Category		$	%	$	%
Capacity Improvements	$103.6	$ 65.1	62.8%	$38.6	37.2%
New Growth Improvements	35.4	-	0.0	35.4	100.0
R&R Improvements	56.0	50.1	89.3	6.0	10.7
Reliability Improvements	5.6	3.5	61.8	2.1	38.2
Storm Drain Removal	17.0	17.0	100.0	-	0.0
Total	**$217.7**	**$135.6**	**62.3%**	**$82.1**	**37.7%**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, and administration costs.

In some cases, a project is needed to correct an existing capacity deficiency, but it is sized to accommodate additional flows from future development. In these cases, the hydraulic modeling results are used to determine the cost breakdown between existing and future users based on the ratio of existing and build-out average dry weather flow.

6.1.1.2 New Growth Improvements

Projects to serve future growth include extensions of existing trunk sewers and the construction of new pump stations. Costs were allocated 100 percent to future use where growth improvements served only future customers.

6.1.1.3 R&R Improvements

R&R projects include improvements to existing trunk sewers or pump stations to extend their useful lives, to repair structural deficiencies, and/or to improve performance so that the facilities have adequate capacity throughout the planning period. These improvements benefit both existing and future customers by upgrading and extending the facilities' useful lives. Therefore, allocations are based on the relative ratio of average dry weather flows for existing and build-out conditions.

6.1.1.4 Reliability Improvements

These projects add parallel sewers where existing pipes cross below major obstacles. Since all users see long-term benefits from these upgraded facilities, allocations are based on relative average dry weather flows, similar to capacity improvements.

6.1.1.5 Storm Drain Removal

These projects mitigate extensive surcharging within the existing collection system and reduce the chances of overflow. These projects are assigned entirely to existing users, since the deficiencies are current.

6.1.2 Wastewater Treatment Improvements

Wastewater treatment improvements are allocated between existing and future domestic customers and Can Seg customers based on relative benefit. The methodology used to allocate each improvement is described in the following sections, and a summary of each cost allocation is shown in Table 7. Detailed allocation criteria are presented in Appendix B.

6.1.2.1 Sutter Plant Improvements

6.1.2.1.1 SP - 1 Influent Screw Pump Addition

Because the additional screw pump provides expansion capacity, it benefits only future domestic customers. For this reason, costs are allocated 100 percent to future domestic customers.

6.1.2.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** This benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.
- **SP - 2.2 New West Junction Structure:** This benefits only domestic customers. The Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.3 Influent Screening:** The new screens benefit only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.4 Grit Removal:** These improvements benefit only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.5 Headworks Building Odor Control Improvements:** This benefits only domestic customers. Allocation between existing and future users is in proportion to the projected PWWF.
- **SP - 2.6 Influent Parshall Flumes:** This benefits only domestic customers. Allocation between existing and future users is in proportion to the projected PWWF.
- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** This benefits only Can Seg customers. All costs are allocated 100 percent to Can Seg customers.

Table 7 Allocation of Wastewater Treatment Improvements to Customers
Engineer's Report
City of Modesto, California

Project Component	Total Project Cost[(1)]	Domestic Customers				Can Seg Customers	
		Existing Users		Future Users			
		$	%	$	%	$	%
Sutter Plant Improvements							
Influent Pump Station Improvements	$ 2.2	$ -	0.0%	$ 2.2	100.0%	$ -	0.0%
Headworks Improvements	14.8	7.6	51.5	1.5	10.4	5.7	38.1
Outfall Pump Station Replacement	17.3	14.4	83.2	2.9	16.8	-	0.0
Decommissioning of Abandoned Facilities	4.9	3.7	74.5	1.2	25.5	-	0.0
Allowance for Flood Protection	2.0	2.0	100.0	-	0.0	-	0.0
Subtotal for Sutter Plant	**$41.3**	**$27.7**	**67.1%**	**$ 7.9**	**19.2%**	**$ 5.7**	**13.7%**
Outfall Pipelines Improvements							
Tuolumne River Crossings	$26.0	$ 9.1	35.0%	$ 1.8	7.1%	$15.1	58.0%
Constructing a Third Outfall	60.7	40.4	66.5	8.2	13.5	12.1	20.0
Slip Lining Portion of the Can Seg Outfall	10.5	-	0.0	-	0.0	10.5	100.0
Subtotal for Outfall Pipelines	**$97.2**	**$49.5**	**50.9%**	**$10.0**	**10.3%**	**$37.7**	**38.8%**
Jennings Plant Improvements							
Secondary Treatment/Can Seg Treatment Facilities	$ 52.4	$ 8.6	16.4%	$ 2.9	5.6%	$40.9	78.0%
Primary Treatment and Solids Handling Facilities	93.5	69.6	74.5	23.9	25.5	-	0.0
Miscellaneous Repairs	0.9	0.1	16.6	<0.1	5.7	0.7	77.6
Subtotal for Jennings Plant	**$146.8**	**$78.4**	**53.4%**	**$26.9**	**18.3%**	**$41.6**	**28.3%**
Engineering Studies							
Master Plan Updates	$2.0	$1.1	54.5%	$0.3	15.7%	$0.6	29.8%
Land Application Study	0.3	-	0.0	-	0.0	0.3	100.0
Subtotal for Engineering Studies	**$2.3**	**$1.1**	**48.4%**	**$0.3**	**14.0%**	**$0.8**	**37.6%**
Total	**$287.6**	**$156.7**	**54.5%**	**$45.1**	**15.7%**	**$85.8**	**29.8%**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, administration, and permitting costs.

6.1.2.1.3 SP - 3 Outfall Pump Station Replacement

The new Outfall Pump Station benefits only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.

6.1.2.1.4 SP - 4 Demolition of Sutter Treatment Facilities

Demolishing the abandoned facilities at the Sutter Plant benefits only the existing domestic customers. Allocation between existing and future users is in proportion to projected average day MMF.

6.1.2.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

The potential for flooding at the Sutter Plant is an existing condition. For this reason, costs are allocated 100 percent to existing domestic customers.

6.1.2.2 Outfall Pipelines

6.1.2.2.1 OP - 1 Replacement of Tuolumne River Pipe Crossings

OP - 1.1 Replacement of Existing Crossings: The new crossings benefit both domestic and Can Seg customers. Since Can Seg customers use the Can Seg Outfall, the entire cost of the Can Seg Outfall was allocated to Can Seg customers. However, both domestic and Can Seg customers benefit from the Primary Domestic Outfall after the completion of the Third Outfall. During the peak canning season, the Primary Outfall acts as a redundant pipeline for the Can Seg Outfall. This season lasts approximately 70 to 80 days, which is approximately 20 percent of the year. For this reason, the Primary Domestic Outfall was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

- **OP - 1.2 Crossing for Third Outfall:** The new crossings benefit both the domestic and Can Seg customers. The cost of the crossing for the Third Outfall was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

6.1.2.2.2 OP - 2 Third Outfall

The cost of the Primary Domestic Outfall's crossing was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

6.1.2.2.3 OP - 3 Slip Lining Portion of the Can Seg Outfall

Lining a portion of the Can Seg Outfall benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.

6.1.2.3 Jennings Plant Improvements

6.1.2.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors (FFRs) and Pump Station Rehabilitation:** This benefits both the domestic and Can Seg customers. Costs are allocated between the domestic and Can Seg customers based on design maximum month BOD loading (design MM BOD loading = 140,900 ppd; Can Seg = 109,400 ppd [77.6%]; domestic = 31,500 ppd [22.4%]).

  The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF (projected ADMMF = 27.4 mgd; existing = 20.4 mgd [74.5%]; future = 7.0 mgd [25.5%]).

- **JP - 1.2 Nutrient Feed and pH Control Systems:** This benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.

- **JP - 1.3 Peroxide Feed System:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 1.4 Aerators in Recirculation Channel:** This benefits both domestic and Can Seg customers. Costs are allocated between the domestic industrial and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF.

- **JP - 1.5 DAF Piping Modifications:** This benefits both domestic and Can Seg customers. Costs are allocated between the domestic and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF.

6.1.2.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 2.2 Yard Piping and Structures:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 2.3 Anaerobic Digesters:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 2.5 Sludge Cake Drying Beds:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

6.1.2.3.3 JP - 3 Miscellaneous Repairs

These projects benefit both domestic and Can Seg customers. Costs were allocated between the domestic and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected MMF.

6.1.2.4 Engineering Studies

6.1.2.4.1 ES - 1 Master Plan Updates

Updates to the Master Plan will benefit both domestic and Can Seg customers. Costs were allocated based on the overall total cost allocation to domestic and Can Seg customers from all of the CIP projects for the Sutter Plant, Outfall Pipelines, and Jennings Plant (total = $285.3M; Can Seg = $84.9M [29.8%]; domestic = $200.4M [70.2%]).

The domestic allocation was then further allocated to existing and future users in proportion to total cost allocation from the CIP projects (domestic = $200.4M; existing = $156.8M [78.3%]; future = $43.6M [21.7%]).

6.1.2.4.2 ES - 2 Land Application Study

This benefits only Can Seg customers. Costs were allocated 100 percent to Can Seg customers.

6.2 Allocation to Billable Constituents

This section allocates project capital costs to the billable constituents of flow, BOD, and TSS. The basis of this analysis is to evaluate each project component or unit process and assess which constituent determines the function of the unit process and/or causes the capital costs incurred. A summary of recommended billable constituent cost allocations for each project component is presented on Table 8, and a discussion of the allocation for various project elements is provided below.

Table 8 Allocation of Project Costs to Billable Constituents
Engineer's Report
City of Modesto, California

Project Components	Total Project Cost[(1)]	Cost Allocation					
		Flow		BOD		TSS	
		$	%	$	%	$	%
Collection System Improvements							
All Collection System Projects	$217.7	$217.7	100.0%	$ -	0.0%	$ -	0.0%
Sutter Plant Improvements							
Influent Pump Station Improvements	$ 2.2	$ 2.2	100.0%	$ -	0.0%	$ -	0.0%
Headworks Improvements	14.8	14.8	100.0	-	0.0	-	0.0
Outfall Pump Station Replacement	17.3	17.3	100.0	-	0.0	-	0.0
Decommissioning of Abandoned Facilities	4.9	1.7	34.0	1.6	33.0	1.6	33.0
Allowance for Flood Protection	2.0	0.7	34.0	0.7	33.0	0.7	33.0
Subtotal for Sutter Plant	**$41.3**	**$36.7**	**88.9%**	**$ 2.3**	**5.5%**	**$ 2.3**	**5.5%**
Outfall Pipelines Improvements							
Tuolumne River Crossings	$26.0	$26.0	100.0%	$ -	0.0%	$ -	0.0%
Constructing a Third Outfall	60.7	60.7	100.0	-	0.0	-	0.0
Slip Lining Portion of the Can Seg Outfall	10.5	10.5	100.0	-	0.0	-	0.0
Subtotal for Outfall Pipelines	**$97.2**	**$97.2**	**100.0%**	**$ -**	**0.0%**	**$ -**	**0.0%**
Jennings Plant Improvements							
Secondary Treatment/Can Seg Treatment Facilities	$ 52.4	$21.8	41.5%	$29.2	55.7%	$ 1.4	2.8%
Primary Treatment and Solids Handling Facilities	93.5	24.4	26.0	20.9	22.4	48.3	51.6
Miscellaneous Repairs	0.9	0.3	34.0	0.3	33.0	0.3	33.0
Subtotal for Jennings Plant	**$146.8**	**$46.4**	**31.6%**	**$50.4**	**34.3%**	**$50.0**	**34.1%**
Engineering Studies							
Master Plan Updates	$ 2.0	$ 0.7	34.0%	$ 0.7	33.0%	$ 0.7	33.0%
Land Application Study	0.3	0.0	0.0	0.3	100.0	0.0	0.0
Subtotal for Engineering Studies	**$ 2.3**	**$ 0.7**	**30.2%**	**$ 0.9**	**40.4%**	**$ 0.7**	**29.3%**
Total - Wastewater Treatment Improvements	**$287.6**	**$181.0**	**62.9%**	**$53.6**	**18.6%**	**$53.0**	**18.4%**
Total - Collection System and Wastewater Treatment	**$505.3**	**$398.7**	**78.9%**	**$53.6**	**10.6%**	**$53.0**	**10.5%**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.

6.2.1 Collection System Improvements

Sizing for all trunk sewer and pump station facilities is dictated by the flows they must accommodate. Consequently, the capital costs associated with all collection system improvements are allocated entirely to flow.

6.2.2 Wastewater Treatment Improvements

6.2.2.1 Sutter Plant Improvements

6.2.2.1.1 SP - 1 Influent Screw Pump Addition

Design criteria and allocation are based exclusively on flow.

6.2.2.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.2 New West Junction Structure:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.3 Influent Screening:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.4 Grit Removal:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.5 Headworks Building Odor Control Improvements:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.6 Influent Parshall Flumes:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** Design criteria and allocation are based exclusively on flow.

6.2.2.1.3 SP - 3 Outfall Pump Station Replacement

Design criteria and allocation are based exclusively on flow.

6.2.2.1.4 SP - 4 Demolition of Sutter Treatment Facilities

This is a general project required for improvements to the site. Therefore, costs are allocated equally to all three wastewater constituents.

6.2.2.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

This is a general project required for improvements to the site. Therefore, costs are allocated equally to all three wastewater constituents.

6.2.2.2 Outfall Pipelines

All outfall facility improvements are designed for increased capacity. Design criteria and allocation for each outfall is based exclusively on flow.

6.2.2.3 Jennings Plant Improvements

6.2.2.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors and Pump Station Rehabilitation:** Design criteria for the FFR Pump Station are based exclusively on flow, and design criteria for the FFRs are based on BOD. Cost allocation is split equally between flow and BOD.
- **JP - 1.2 Nutrient Feed and pH Control Systems:** Nutrient and pH control are required for secondary treatment to perform properly. Cost allocation is 40 percent to flow, 30 percent to BOD, and 30 percent to TSS.
- **JP - 1.3 Peroxide Feed System:** Design criteria and allocation are based exclusively on flow.
- **JP - 1.4 Aerators in Recirculation Channel:** Design criteria and allocation are based exclusively on BOD.
- **JP - 1.5 DAF Piping Modifications:** The DAFs are required for TSS removal. Therefore, allocation is based exclusively on TSS.

6.2.2.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities:** Design criteria are based on flow. Primary treatment also removes TSS and BOD. Cost allocation is 70 percent to flow, 10 percent to BOD, and 20 percent to TSS.
- **JP - 2.2 Yard Piping and Structures:** Design criteria and allocation are based exclusively on flow.
- **JP - 2.3 Anaerobic Digesters:** Primary sludge and WAS will both be digested. Of the total sludge sent to the digesters, approximately 70 percent will be primary sludge, which corresponds with TSS removal during primary treatment. The other 30 percent will be WAS, which consists of solids from BOD generated biomass. Therefore, cost allocation is 30 percent to BOD and 70 percent to TSS.

- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities):** Cost allocation is 30 percent to BOD and 70 percent to TSS on the same basis as anaerobic digesters.

- **JP - 2.5 Sludge Cake Drying Beds:** Cost allocation is 30 percent to BOD and 70 percent to TSS on the same basis as anaerobic digesters.

6.2.2.3.3 JP - 3 Miscellaneous Repairs

These are general projects required for improvements to the site. Costs are allocated equally to all three billable constituents.

6.2.2.4 Engineering Studies

6.2.2.4.1 ES - 1 Master Plan Updates

Costs are allocated equally to all three billable constituents.

6.2.2.4.2 ES - 2 Land Application Study

The study will determine BOD loading rates for the ranch land. Costs are allocated exclusively to BOD.

7.0 PROJECT PHASING AND CASH FLOW PROJECTIONS

The wastewater collection system and treatment improvements program outlined will be constructed in phases throughout the 20-year planning period. These improvements will be implemented in five-year periods. Table 9 summarizes the phasing of the collection system projects, and Appendix A shows the capital expenditures associated with the collection system implementation plan in more detail. Phasing costs are driven by reliability priority and anticipated new development.

The wastewater treatment improvements will also be constructed in phases. Timing for the projects was determined for each year for the first five years and for each five-year period for the remaining 15 years of the CIP. Similarly, the CIP cash flow was developed on a year-by-year basis for the first five years and on an average annual basis for each five-year period thereafter. Table 9 also summarizes the capital costs for each phase.

Combining the entire wastewater capital improvement program for the collection system and treatment improvements results in the cost flow presented in Figure 8.

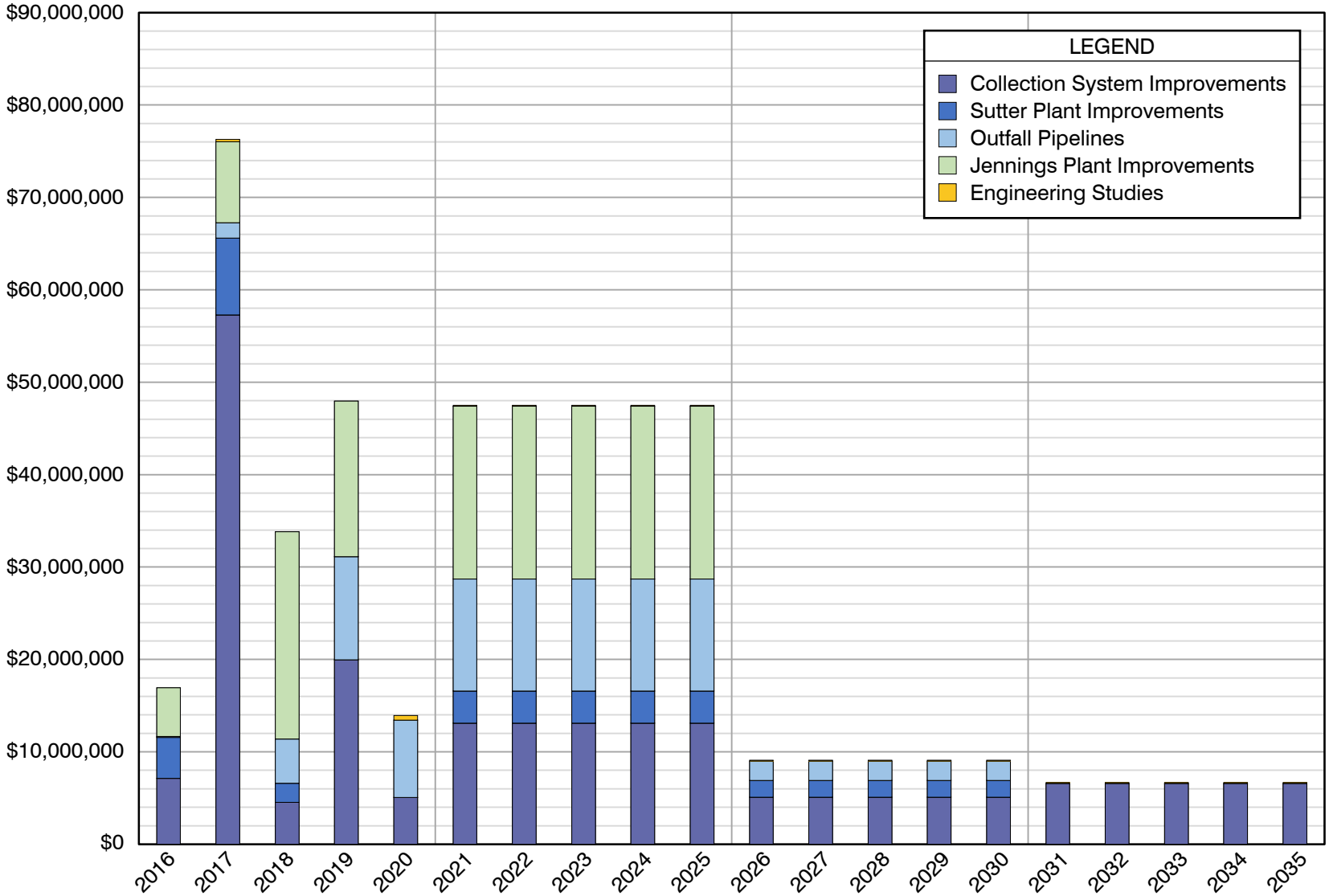
Table 9 Wastewater Treatment CIP Phasing
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Capital Improvement Program Cost per Phase ($)[1]							
			Phase 1					Phase 2	Phase 3	Phase 4
			2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035
Collection System Improvements										
Capacity Improvements	-	103,642,000	2,324,000	34,283,000	-	16,967,000	2,071,000	40,769,000	1,589,000	5,639,000
New Growth Improvements	-	35,420,000	-	-	-	-	-	11,050,000	10,486,000	13,884,000
R&R Improvements	-	56,033,000	3,589,500	17,125,500	3,961,000	3,000,000	3,000,000	8,691,000	8,333,000	8,333,000
Reliability Improvements	-	5,601,000	186,500	4,854,500	560,000	-	-	-	-	-
Storm Drain Removal	-	17,040,000	1,020,000	1,020,000	-	-	-	5,000,000	5,000,000	5,000,000
Total - Collection System Improvements		**217,736,000**	**7,120,000**	**57,283,000**	**4,521,000**	**19,967,000**	**5,071,000**	**65,510,000**	**25,408,000**	**32,856,000**
Sutter Plant Improvements										
Influent Pump Station Improvements	SP-1	2,198,000	-	-	-	-	-	-	2,198,000	-
Headworks, Dryden Box, and Influent Flume Improvements Project	SP-2	14,849,000	4,454,900	8,315,600	2,078,900	-	-	-	-	-
Outfall Pump Station Replacement	SP-3	17,332,000	-	-	-	-	-	17,332,000	-	-
Demolition of Sutter Treatment Facilities	SP-4	4,942,000	-	-	-	-	-	-	4,942,000	-
Allowance for Flood Protection of Remaining Sutter Facilities	SP-5	2,000,000	-	-	-	-	-	-	2,000,000	-
Subtotal - Sutter Plant Improvements		**41,321,000**	**4,454,900**	**8,315,600**	**2,078,900**	**-**	**-**	**17,332,000**	**9,140,000**	**-**
Outfall Pipelines										
Tuolumne River Pipe Crossings	OP-1	26,045,000	98,700	1,657,600	4,779,900	11,148,000	8,361,000	-	-	-
Third Outfall Pipeline	OP-2	60,679,000	-	-	-	-	-	60,679,000	-	-
Slip Lining Portion of the Can Seg Outfall	OP-3	10,456,000	-	-	-	-	-	-	10,456,000	-
Subtotal Outfall Pipelines		**97,180,000**	**98,700**	**1,657,600**	**4,779,900**	**11,148,000**	**8,361,000**	**60,679,000**	**10,456,000**	**-**
Jennings Plant Improvements										
Secondary Treatment/Can Seg Treatment Facilities Upgrades	JP-1	52,422,000	4,822,400	8,332,700	22,438,400	16,828,800	-	-	-	-
Primary Treatment and Solids Handling Facilities	JP-2	93,530,000	-	-	-	-	-	93,530,000	-	-
Miscellaneous Repairs	JP-3	873,000	436,400	436,400	-	-	-	-	-	-
Subtotal - Jennings Plant Improvements		**146,825,000**	**5,258,800**	**8,769,100**	**22,438,400**	**16,828,800**	**-**	**93,530,000**	**-**	**-**

Table 9 Wastewater Treatment CIP Phasing
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Capital Improvement Program Cost per Phase ($)[1]							
			Phase 1					Phase 2	Phase 3	Phase 4
			2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035
Engineering Studies										
Master Plan Updates	ES-1	2,000,000	-	-	-	-	500,000	500,000	500,000	500,000
Land Application Study	ES-2	250,000	-	250,000	-	-	-	-	-	-
Subtotal - Engineering Studies		**2,250,000**	**-**	**250,000**	**-**	**-**	**500,000**	**500,000**	**500,000**	**500,000**
Total - Wastewater Treatment Improvements		**287,576,000**	**9,812,400**	**18,992,300**	**29,297,800**	**27,976,800**	**8,861,000**	**172,041,000**	**20,096,000**	**500,000**
Total - Collection System and Wastewater Treatment Improvements		**505,312,000**	**16,932,400**	**76,275,300**	**33,818,200**	**47,943,800**	**13,932,000**	**237,551,000**	**45,504,000**	**33,356,000**

Note:
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.



CIP CASH FLOW

FIGURE 8

CITY OF MODESTO
ENGINEER'S REPORT

Source: Collection System Master Plan and Wastewater Treatment Master Plan

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APPENDIX A – COLLECTION SYSTEM CAPITAL IMPROVEMENT PROGRAM

Table A.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost						Capital Improvement Program Cost per Phase ($)								Future Users Benefit (%)	Cost Allocation	
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1					Phase 2	Phase 3	Phase 4		Existing Improvements ($)	Future Improvements ($)
											2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035			
Existing System Improvements																					
Area 1																					
West Trunk																					
Hahn Lift Station	LS # 19 - Hahn	Honey Creek Road and Nightingale Drive	Increase the firm capacity from 0.65 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.6 mgd	2.6 mgd	Replace	-	$ 1,102,000	$ 1,791,000	$ 1,791,000								14%	$ 1,537,000	$ 254,000
Rumble Trunk																					
Rumble Lift Station	LS # 30 - Rumble	Rumble Road near Bay Lane	Increase the firm capacity from 1.37 mgd to 2.33 mgd to meet existing and future PWWFs.	Capacity	1.4 mgd	3.5 mgd	Replace	-	$ 1,403,000	$ 2,280,000						$ 2,280,000			28%	$ 1,645,000	$ 635,000
Area 2																					
Sutter Trunk																					
Gravity Pipeline	S-4a	Highway 99	Increase reliability by constructing a parallel 16-inch diameter trunk under Highway 99.	Reliability	-	16	New	-		$ 373,000	$ 186,500	$ 186,500							0%	$ 373,000	$ -
Gravity Pipeline	S-4b	Highway 99	Rehabilitate existing 16-inch diameter trunk.	Rehabilitation	16	-	Rehab	-		$ 113,000	$ 56,500	$ 56,500							0%	$ 113,000	$ -
Area 3																					
River Trunk																					
Gravity Pipeline[3]	RT-1	Tuolumne Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	48	New	-		$3,211,000						$ 3,211,000			41%	$ 1,896,000	$ 1,315,000
Gravity Pipeline[3]	RT-2	Colorado Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	54	New	-		$8,648,000						$ 8,648,000			41%	$ 5,105,000	$ 3,543,000
Gravity Pipeline[3]	RT-3	Colorado Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	60/72	New	-		$7,442,000						$ 7,442,000			41%	$ 4,393,000	$ 3,049,000
Gravity Pipeline[3]	RT-4	Tuolumne Boulevard	Provide peak wet weather diversion for the existing Sutter Trunk.	Capacity	-	21	New	-		$1,137,000						$ 1,137,000			41%	$ 671,000	$ 466,000
Force Main[3]	RT-5	Tuolumne Boulevard	Two force mains allows the system to maintain flushing velocities through a wide range of flows and will convey flows from the River Trunk Pump Station.	Capacity	-	24 & 36	New	-		$5,818,000						$ 5,818,000			41%	$ 3,435,000	$ 2,383,000
Gravity Pipeline[3]	RT-6	Beard Brook North Gravity Alignment	A gravity extension of the Dry Creek crossing that conveys flows to the River Trunk Pump Station.	Capacity	-	-	New	-		$16,967,000				$ 16,967,000					41%	$ 10,017,000	$ 6,950,000
Gravity Pipeline[3]	RT-7	B Street	Reroute flows to the River Trunk Pump Station.	Capacity	-	36 & 48	New	-		$2,071,000					$ 2,071,000				41%	$ 1,223,000	$ 848,000
Gravity Pipeline[3]	RT-8	Open Space	Convey flows from the new Shackelford PS to the new River Trunk in Colorado.	Capacity	-	14 & 18	New	-		$1,944,000						$ 1,944,000			44%	$ 1,086,000	$ 858,000
Gravity Pipeline[3]	RT-9	Sutter Avenue	Based on the results of the condition assessment, the Sutter Ave Trunk will require rehabilitation.	Rehabilitation	-	24	New	-		$533,000	$ 533,000								41%	$ 315,000	$ 218,000
Gravity Pipeline[3]	RT-10	Open Space	Based on the results of the condition assessment, a segment of the River Trunk will require rehabilitation.	Rehabilitation	-	48	New	-		$14,069,000		$ 14,069,000							41%	$ 8,306,000	$ 5,763,000
River Bank Armament[3]	RT-11	Tuolumne River Bank	Armoring the riverbank to prevent future erosion and expose of the CSL and River Trunk.	Reliability	-	-	New	-		$4,668,000		$ 4,668,000							41%	$ 2,756,000	$ 1,912,000
CSL Diversion Structures[3]	RT-12	North or Sutter Plant	A contingency to divert flows between the CSL and River Trunk.	Reliability	-	-	New	-		$560,000			$ 560,000						41%	$ 331,000	$ 229,000
Shackelford Lift Station[3]	LS-Shackelford	East of Crows Landing	Eliminate the siphon below the Tuolumne River.	Capacity	-	4.2 mgd	New	-		$2,989,000						$ 2,989,000			44%	$ 1,670,000	$ 1,319,000
River Trunk Lift Station[3]	LS-River Trunk	Morton Boulevard	Eliminate River Trunk inverted siphon and associated issues.	Capacity	-	54.5 mgd	New	-		$33,483,000		$ 33,483,000							41%	$ 19,767,000	$ 13,716,000
Area 4																					
Downtown Trunks																					
Gravity Pipeline	DT-1	J Street	The trunk in J Street exceeds the maximum d/D criteria under PWWF and causes the existing 12-inch pipeline to surcharge.	Capacity	12	15	Replace	2,400	$ 205	$ 800,000		$ 800,000							4%	$ 765,000	$ 35,000
Gravity Pipeline	DT-2	Kimble Street and Floto Street	The existing 10-inch diameter pipelines exceed the maximum d/D criteria under PWWF at approximately 90-percent capacity.	Capacity	10	12	Replace	1,000	$ 163	$ 265,000						$ 265,000			4%	$ 254,000	$ 11,000
Area 5																					
Santa Rosa Trunk																					
Gravity Pipeline	SR-1	Kimble Street and Floto Street	This segment has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	24/30	-	Rehab	1,700		$ 961,000			$ 961,000						0%	$ 961,000	$ -
Gravity Pipeline	SR-4	Coffee Road	The existing 10-inch diameter pipelines in Coffee Road exceed the maximum d/D criteria under PWWF and cause the existing 10-inch pipelines to surcharge.	Capacity	10	15	Replace	1,600	$ 205	$ 533,000	$ 533,000								0%	$ 533,000	$ -
Gravity Pipeline	SR-6	Kimble Street and Floto Street	This reach is over 50 years old and has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	18	-	Rehab	1,000		$ 358,000						$ 358,000			0%	$ 358,000	$ -
Rose and Celeste Trunk																					
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste	Rose Avenue and Celeste Drive	Increase the firm capacity from 0.86 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.9 mgd	2.6 mgd	Replace	-	$ 1,102,000	$ 1,791,000						$ 1,791,000			0%	$ 1,791,000	$ -
Area 6																					
Empire Trunk																					
Gravity Pipeline[4]	EM-1	McClure Road	The existing pipelines in McClure Road exceed the maximum d/D criteria under PWWF and cause the 10-inch pipelines to surcharge.	Capacity	10	15	Replace	200	$ -	In Progress									0%	$ -	$ -
Gravity Pipeline[4]	EM-2	Garner Road	This relief pipeline will alleviate surcharging within the Empire Trunk along Yosemite Boulevard and McClure Road.	Capacity	-	18	New	3,300	$ -	In Progress									0%	$ -	$ -
Gravity Pipeline	EM-3	Hoover Avenue	The existing pipelines exceed the maximum d/D under PWWF at approximately 95-percent capacity.	Capacity	10	12	Replace	1,800	$ 163	$ 476,000						$ 476,000			14%	$ 409,000	$ 67,000
Gravity Pipeline	EM-4	Benson Avenue	The 15-inch diameter trunk in Benson Avenue exceeds the d/D criteria under PWWF at approximately 93 percent capacity.	Capacity	15	18	Replace	1,400	$ 223	$ 507,000						$ 507,000			3%	$ 491,000	$ 16,000
Benson Lift Station	LS # 03 - Benson	Benson Avenue	Increase the firm capacity from 0.22 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.2 mgd	2.6 mgd	Replace	-	$ 1,102,000	$ 1,791,000						$ 1,791,000			0%	$ 1,785,000	$ 6,000

Table A.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost						Capital Improvement Program Cost per Phase ($)								Future Users Benefit (%)	Cost Allocation	
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1					Phase 2	Phase 3	Phase 4		Existing Improvements ($)	Future Improvements ($)
											2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035			
Sonoma/Lakewood Trunk																					
Scenic Lift Station[4]	LS # 31 - Scenic	Scenic Drive	Increase the firm capacity from 2.3 mgd to 18.4 mgd to meet existing and future PWWFs.	Capacity	13.0 mgd	25.6 mgd	Replace	-	$ -	In Progress									52%	$ -	$ -
Area 8																					
Ceres Trunk																					
Gravity Pipeline[4]	C-1	Parallel to Tuolumne River	This project rehabilitates the oldest and most deteriorated segment of the Ceres Trunk.	Rehabilitation	18/21/24	-	Replace	2,900	$ -	In Progress									0%	$ -	$ -
Gravity Pipeline[4]	C-2a	Highway 99 crossing	Increase reliability by constructing a parallel 24-inch diameter trunk under Highway 99.	Reliability	-	24	New	150	$ -	In Progress									0%	$ -	$ -
Gravity Pipeline[4]	C-2b	Highway 99 crossing	Rehabilitate existing 24-inch diameter trunk.	Reliability	-	24	New	150	$ -	In Progress									0%	$ -	$ -
City-wide																					
Storm Drain	SDR	Various Locations	Remove storm drain connections from the sewer collection system.	Storm Drain Removal	-	-	-	-		$17,040,000	$ 1,020,000	$ 1,020,000				$ 5,000,000	$ 5,000,000	$ 5,000,000	0%	$ 17,040,000	$ -
Rehabilitation & Replacement	R&R	Various Locations	Small and Large Diameter Rehabilitation and Replacement Program.	Rehabilitation	-	-	-	-		$ 39,999,000	$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 8,333,000	$ 8,333,000	$ 8,333,000	0%	$ 39,999,000	$ -
Existing Improvements Cost Estimate										172,618,000	7,120,000	57,283,000	4,521,000	19,967,000	5,071,000	51,990,000	13,333,000	13,333,000		129,025,000	43,593,000
Future System Improvements																					
Area 1																					
West Trunk																					
Gravity Pipeline	W-1	Carpenter Road to Sutter Plant	Build-out PWWF causes the lower reach of the West Trunk to exceed the maximum depth criteria at approximately 90 percent capacity.	Capacity	-	48	New	5,200	$ 552	$ 4,664,000								$ 4,664,000	34%	$ 3,069,000	$ 1,595,000
Gravity Pipeline	W-2	Veneman Avenue	The trunk in Veneman Avenue exceeds the d/D criteria at approximately 90 percent capacity.	Capacity	18	21	Replace	700	$ 260	$ 296,000							$ 296,000		13%	$ 257,000	$ 39,000
Gravity Pipeline	W-3	Undeveloped Area	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	15	New	4,000	$ 205	$ 1,333,000								$ 1,333,000	100%	$ -	$ 1,333,000
Force Main	W-4	North Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	6	New	9,000	$ 147	$ 2,150,000								$ 2,150,000	100%	$ -	$ 2,150,000
Gravity Pipeline	W-5	Dakota Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	12	New	1,200	$ 163	$ 319,000								$ 319,000	100%	$ -	$ 319,000
Gravity Pipeline	W-6	Kansas Avenue	This improvement is recommended to service infill as the sewer service area extends to include county islands.	New Growth	-	15	New	4,300	$ 205	$ 1,433,000								$ 1,433,000	100%	$ -	$ 1,433,000
Gravity Pipeline	W-7	Carpenter Road and Paradise Road	This improvement is recommended to service future growth within the Highway 132 CPD.	New Growth	-	12	New	2,900	$ 163	$ 769,000							$ 769,000		100%	$ -	$ 769,000
Kansas Lift Station	LS # 63	Kansas Avenue and Altamont Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	2.0 mgd	New	-	$ 909,000	$ 1,477,000								$ 1,477,000	100%	$ -	$ 1,477,000
Dakota Lift Station	LS # 64	Dakota Road and Beckwith Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.0 mgd	New	-	$ 605,000	$ 983,000								$ 983,000	100%	$ -	$ 983,000
Woodland Lift Station[5]	LS # 39	Woodland Avenue and Poust Road	It is proposed that the firm capacity be increased to 25.2 mgd from its current capacity of 20.9 mgd to meet future PWWFs.	Capacity	27.4 mgd	32.4 mgd	Expand	-	-	$ 1,293,000							$ 1,293,000		39%	$ 790,000	$ 503,000
Rumble Trunk																					
Gravity Pipeline	R-1	Claremont Avenue and Maud Kump Terrace	Under PWWF conditions, this reach of the Rumble Trunk experiences flow depths in excess of the maximum d/D at approximately 90-percent capacity.	Capacity	21	24	Replace	5,100	$ 298	$ 2,470,000						$ 2,470,000			19%	$ 1,993,000	$ 477,000
Gravity Pipeline	R-2	McHenry Avenue	This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD.	New Growth	-	10	New	900	$ 137	$ 200,000						$ 200,000			100%	$ -	$ 200,000
Dale Trunk																					
Gravity Pipeline	D-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	15	New	1,200	$ 205	$ 400,000							$ 400,000		100%	$ -	$ 400,000
Force Main	D-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	6	New	2,600	$ 147	$ 621,000							$ 621,000		100%	$ -	$ 621,000
Gravity Pipeline	D-3	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	12	New	1,700	$ 163	$ 450,000							$ 450,000		100%	$ -	$ 450,000
Gravity Pipeline	D-4	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	10	New	2,200	$ 137	$ 489,000							$ 489,000		100%	$ -	$ 489,000
Gravity Pipeline	D-5	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	8	New	1,500	$ 109	$ 267,000							$ 267,000		100%	$ -	$ 267,000
Chapman Lift Station	LS # 60	Chapman Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.6 mgd	New	-	$ 785,000	$ 1,276,000							$ 1,276,000		100%	$ -	$ 1,276,000
North Trunk Extension																					
Gravity Pipeline	N-1	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	27	New	2,800	$ 335	$ 1,524,000						$ 1,524,000			100%	$ -	$ 1,524,000
Gravity Pipeline	N-2	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	24	New	6,100	$ 298	$ 2,954,000						$ 2,954,000			100%	$ -	$ 2,954,000
Gravity Pipeline	N-3	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	21	New	1,600	$ 260	$ 676,000							$ 676,000		100%	$ -	$ 676,000
Gravity Pipeline	N-4	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	18	New	3,100	$ 223	$ 1,123,000							$ 1,123,000		100%	$ -	$ 1,123,000
Gravity Pipeline	N-5	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	2,400	$ 205	$ 800,000							$ 800,000		100%	$ -	$ 800,000
Gravity Pipeline	N-6	Tully Road and Pelandale Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	4,800	$ 137	$ 1,069,000						$ 1,069,000			100%	$ -	$ 1,069,000
Gravity Pipeline	N-7	American Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	3,100	$ 205	$ 1,034,000								$ 1,034,000	100%	$ -	$ 1,034,000
Gravity Pipeline	N-8	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	5,600	$ 137	$ 1,246,000								$ 1,246,000	100%	$ -	$ 1,246,000
Gravity Pipeline	N-9	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	8	New	6,300	$ 109	$ 1,116,000								$ 1,116,000	100%	$ -	$ 1,116,000

Table A.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California

Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost						Capital Improvement Program Cost per Phase ($)								Future Users Benefit (%)	Cost Allocation	
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost ($)	Capital Improvement Cost[1],[2] ($)	Phase 1					Phase 2	Phase 3	Phase 4		Existing Improvements ($)	Future Improvements ($)
											2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035			
Pelandale Lift Station	LS # 59	Pelandale Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.3 mgd	New	-	$ 397,000	$ 645,000						$ 645,000			100%	$ -	$ 645,000
Kiernan Lift Station	LS # 65	Kiernan Avenue and Carver Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.5 mgd	New	-	$ 454,000	$ 738,000								$ 738,000	100%	$ -	$ 738,000
Area 3																					
Sutter Trunk																					
Gravity Pipeline	S-1	Jefferson Street	The trunk in Jefferson Avenue exceeds the d/D criteria at approximately 89 percent capacity.	Capacity	16	18	Replace	760	$ 223	$ 275,000								$ 275,000	26%	$ 204,000	$ 71,000
Area 6																					
Sonoma Trunk Extension																					
Gravity Pipeline	SO-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	24	New	3,300	$ 298	$ 1,597,000						$ 1,597,000			100%	$ -	$ 1,597,000
Gravity Pipeline	SO-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	18	New	2,600	$ 223	$ 943,000						$ 943,000			100%	$ -	$ 943,000
Gravity Pipeline	SO-3	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	15	New	2,800	$ 205	$ 933,000						$ 933,000			100%	$ -	$ 933,000
Gravity Pipeline	SO-4	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	8	New	3,100	$ 109	$ 549,000						$ 549,000			100%	$ -	$ 549,000
Wood Sorrel Lift Station	LS # 61	North of Wood Sorrel Drive and Sylvan Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.1 mgd	New	-	$ 358,000	$ 582,000						$ 582,000			100%	$ -	$ 582,000
Lakewood Trunk Extension																					
Gravity Pipeline	L-1	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	18	New	2,900	$ 223	$ 1,051,000							$ 1,051,000		100%	$ -	$ 1,051,000
Gravity Pipeline	L-2	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	15	New	1,700	$ 205	$ 567,000							$ 567,000		100%	$ -	$ 567,000
Gravity Pipeline	L-3	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	12	New	800	$ 163	$ 211,000							$ 211,000		100%	$ -	$ 211,000
Gravity Pipeline	L-4	Plainview Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	3,000	$ 137	$ 668,000							$ 668,000		100%	$ -	$ 668,000
Gravity Pipeline	L-5	Claus Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	8	New	300	$ 109	$ 54,000						$ 54,000			100%	$ -	$ 54,000
Gravity Pipeline	L-6	Merle Ave	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	400	$ 137	$ 89,000								$ 89,000	100%	$ -	$ 89,000
Litt Lift Station	LS # 67	Litt Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.3 mgd	New	-	$ 688,000	$ 1,118,000							$ 1,118,000		100%	$ -	$ 1,118,000
Area 10																					
Ustick Trunk																					
Gravity Pipeline	U-1	Ustick Road	At build-out of Area 10, the PWWF from new growth will cause the Ustick Trunk to surcharge.	Capacity	12	15	Replace	2,100	$ 205	$ 700,000								$ 700,000	56%	$ 306,000	$ 394,000
Gravity Pipeline	U-2	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	1,000	$ 137	$ 223,000								$ 223,000	100%	$ -	$ 223,000
Force Main	U-3	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	4	New	427	$ 144	$ 99,000								$ 99,000	100%	$ -	$ 99,000
Gravity Pipeline	U-4	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	3,400	$ 137	$ 757,000								$ 757,000	100%	$ -	$ 757,000
Whitmore/Carpenter Lift Station	LS # 62	Whitmore Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.8 mgd	New	-	$ 546,000	$ 887,000								$ 887,000	100%	$ -	$ 887,000
Future Improvements Cost Estimate										45,118,000						13,520,000	12,075,000	19,523,000		6,619,000	38,499,000
Total Capital Improvement Cost Estimate										217,736,000	7,120,000	57,283,000	4,521,000	19,967,000	5,071,000	65,510,000	25,408,000	32,856,000		135,644,000	82,092,000

Notes:

1. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.
2. Total construction cost includes the baseline construction cost plus a 25 percent allowance to account for unforeseen events and unknown conditions. Total project cost includes a 30 percent allowance to cover other costs including engineering, construction management, and project administration.
3. Cost estimates are from the River Trunk Realignment, Beard Brook Siphon and Cannery Segregation Line Improvement Project PDR.
4. Cost for project is not included in CIP because the improvement is currently in progress.
5. The cost for Woodlake Lift Station is based on the 2007 Master Plan and was escalated to reflect the most probable current cost.
6. Lift station capacities refer to the total capacity unless noted otherwise.

APPENDIX B – WASTEWATER TREATMENT CAPITAL IMPROVEMENT PROGRAM

Table B.1 Wastewater Treatment CIP
Engineer's Report
City of Modesto, California

Project	Project Number	Description	Purpose	Improvement Category	Total Project Cost ($)[1]
Sutter Plant Improvements					
Influent Screw Pump Addition	**SP-1**	**Installation of a fifth influent screw pump.**	**Increases influent pumping capacity to meet the projected PWWF.**	**Capacity**	**2,198,000**
Headworks, Dryden Box, and Influent Flume Improvements Project	**SP-2**				
New Dryden Box	SP-2.1	New Dryden Box and associated yard piping	Replaces corroded box and provides improved and connection with existing Can Seg sewers.	Reliability/Capacity	2,600,000
New West Junction Structure	SP-2.2	West Trunk Junction Structure, improvements to the existing Junction Box No. 1, and associated yard piping.	Provides connection with new River Trunk	Reliability/Capacity	300,000
Influent Screening	SP-2.3	Four new multi-rake screens with 1/4 inch bar spacing, one new multi-rake with emergency bypass. Also includes the installation of a new skid mounted washer compactor.	Improves screenings capture and reduces maintenance on downstream processes.	Reliability/Capacity	4,075,000
Grit Removal	SP-2.4	Installation of a grit removal mechanism in Grit Basin No. 4 and an additional grit pump; modifications will be made to all grit basins.	Increases grit removal capacity at PHWWF. Improves grit capture and reduces maintenance on downstream processes.	Reliability/Capacity	1,469,000
Headworks Building Odor Control Improvements	SP-2.5	Installation of higher capacity fans, duct replacement, and expanding the biofilter.	Complies with new ventilation standards.	Reliability/Capacity	3,009,000
Influent Parshall Flumes	SP-2.5	Installation of flow straightening baffles and bring the third, standby flume online.	Improves accuracy of influent flow metering.	Reliability/Capacity	336,000
Pumping Plant No. 3	SP-2.7	Two additional low capacity pumps for pumping Can Seg flow to Jennings Plant; three new multi-rake screens with 3/8" bar spacing.	Extends turndown capability of Can Seg pumping to allow year-round segregation; improves screenings capture to reduce maintenance on downstream processes.	Reliability/Capacity	3,060,000
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal					**14,849,000**
Outfall Pump Station Replacement	**SP-3**	**New pump station to replace the existing Primary Effluent Pump Station.**	**Provides expanded capacity and pumping head for peak wet weather flows; raises walls of wet well above the floodplain.**	**Reliability/Capacity**	**17,332,000**
Demolition of Sutter Treatment Facilities	**SP-4**	**Remove concrete structures to below grade and backfill.**	**Provides space for future facilities.**	**Reliability**	**4,942,000**
Allowance for Flood Protection of Remaining Sutter Facilities	**SP-5**	**Flood walls, raising grade, raising structures.**	**Provides protection for a 100-year flood.**	**Reliability**	**2,000,000**
				Subtotal - Sutter Plant Improvements	**41,321,000**
Outfall Pipelines					
Tuolumne River Pipe Crossings	**OP-1**				
Replacement of Existing Crossings	OP-1.1	River crossing replacement for Primary Domestic Outfall and Can Seg Outfall.	Replaces corroded pipeline and improves reliability at critical location.	Rehabilitation/ Capacity	19,780,000
Crossing for Third Outfall	OP-1.2	New river crossing for third outfall.		Reliability/Capacity	6,265,000
Tuolumne River Pipe Crossings Subtotal					**26,045,000**
Third Outfall Pipeline	**OP-2**	**New domestic outfall pipeline from the Sutter Plant to the Jennings Plant.**	**Provides additional PWWF capacity for Primary Domestic Outfall and redundancy for Can-Seg Outfall during DWF conditions.**	**Reliability/Capacity**	**60,679,000**
Slip Lining Portion of the Can-Seg Outfall	**OP-3**	**Pipe lining and appurtenances.**	**Repairs corroded sections and Improves reliability of Can Seg Outfall.**	**Rehabilitation**	**10,456,000**
				Subtotal - Outfall Pipelines	**97,180,000**

Table B.1 Wastewater Treatment CIP
Engineer's Report
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Project	Project Number	Description	Purpose	Improvement Category	Total Project Cost ($)[1]
Jennings Plant Improvements					
Secondary Treatment/ Can Seg Treatment Facilities Upgrades	**JP-1**				
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	New media, rotary distributor, and pumps.	Improves reliability and performance of secondary treatment.	Rehabilitation/ Capacity	40,929,000
Nutrient Feed and pH Control Systems	JP-1.2	Chemical feed pumps, storage tanks, and feed system.	Adds nutrients and adjusts the pH of the Can-Seg flows to facilitate biological treatment process.	Reliability	2,283,000
Peroxide Feed System	JP-1.3	Chemical feed pumps, storage tanks, and feed system.	Controls odors from FFRs.	Reliability	391,000
Aerators in Recirculation Channel	JP-1.4	New aerators and electrical system.	Increases secondary treatment capacity for domestic and Can-Seg flows.	Rehabilitation/ Capacity	8,062,000
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	Modification of DAF effluent piping to route the flow to the Irrigation Forebay.	Allows the DAF effluent to be used as irrigation water.	Rehabilitation/ Capacity	757,000
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal					**52,422,000**
Primary Treatment and Solids Handling Facilities	**JP-2**				
Primary Treatment Facilities	JP-2.1	Three 110-foot diameter primary clarifiers and a primary sludge pump station.	Replaces aging primary treatment facilities at the Sutter Plant.	Reliability/Capacity	15,969,000
Yard Piping and Structures	JP-2.2		Provides connections between the new treatment facilities with the existing facilities at the Jennings Plant.	Reliability/Capacity	13,174,000
Anaerobic Digesters	JP-2.3	Three 115-foot diameter digesters with a 31-foot sidewater depth with a Digester Control Building.	Replaces aging digesters at the Sutter Plant and provides treatment of the WAS generated by the BNR/tertiary facilities.	Reliability/Capacity	40,855,000
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	Two sieve drum concentrators for WAS thickening and two belt filter presses for dewatering housed in building.	Concentrates sludge and biosolids to reduce solar drying costs.	Reliability/Capacity	11,756,000
Sludge Cake Drying Beds	JP-2.5	Asphalt-paved beds with concrete containment walls.	Provides solar drying of dewatered biosolids to reduce disposal costs.	Reliability/Capacity	11,776,000
Primary Treatment and Solids Handling Facilities Subtotal					**93,530,000**
Miscellaneous Repairs	**JP-3**	**General replacement and upgrades of existing facilities.**	**Improves reliability and extends life of existing facilities.**	**Rehabilitation**	**873,000**
				Subtotal - Jennings Plant Improvements	**146,825,000**
Engineering Studies					
Master Plan Updates	**ES-1**	**The Master Plan will undergo an update every five years.**	**Allows for revised strategies to adapt to changing conditions.**		**2,000,000**
Land Application Study	**ES-2**	**Organic Loading Study**	**Identifies the maximum BOD loading rates on ranch land per new Waste Discharge Requirements.**		**250,000**
				Subtotal - Engineering Studies	**2,250,000**
				WTMP CIP TOTAL	**287,576,000**

Notes:
(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.

Table B.2 **Wastewater Treatment CIP Cost Allocation - Customers**
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Domestic Customers				Can-Seg Customers		Comments
			Existing Users		Future Users				
			$	%	$	%	$	%	
Sutter Plant Improvements									
Influent Screw Pump Addition	**SP-1**	**2,198,000**	**-**	**0.0%**	**2,198,000**	**100.0%**	**-**	**0.0%**	**Improvements for future growth**
Headworks, Dryden Box, and Influent Flume Improvements Project	**SP-2**								
New Dryden Box	SP-2.1	2,600,000	-	0.0%	-	0.0%	2,600,000	100.0%	
New West Junction Structure	SP-2.2	300,000	249,500	83.2%	50,500	16.8%	-	0.0%	Allocation based on relative PWWF, current PWWF is 70.7 mgd and projected future PWWF is 85 mgd.
Influent Screening	SP-2.2	4,075,000	3,389,400	83.2%	685,600	16.8%	-	0.0%	Allocation based on relative PWWF.
Grit Removal	SP-2.3	1,469,000	1,221,900	83.2%	247,100	16.8%	-	0.0%	Allocation based on relative PWWF.
Headworks Building Odor Control Improvements	SP-2.4	3,009,000	2,502,800	83.2%	506,200	16.8%	-	0.0%	Allocation based on relative PWWF.
Influent Parshall Flumes	SP-2.5	336,000	279,500	83.2%	56,500	16.8%	-	0.0%	Allocation based on relative PWWF.
Pumping Plant No. 3	SP-2.6	3,060,000	-	0.0%	-	0.0%	3,060,000	100.0%	
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal		**14,849,000**	**7,643,100**	**51.5%**	**1,545,900**	**10.4%**	**5,660,000**	**38.1%**	
Outfall Pump Station Replacement	**SP-3**	**17,332,000**	**14,416,100**	**83.2%**	**2,915,900**	**16.8%**	**-**	**0.0%**	**Allocation based on relative PWWF.**
Demolition of Sutter Treatment Facilities	**SP-4**	**4,942,000**	**3,679,400**	**74.5%**	**1,262,600**	**25.5%**	**-**	**0.0%**	**Allocation based on relative MMF.**
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	**SP-5**	**2,000,000**	**2,000,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	
Subtotal - Sutter Plant		**41,321,000**	**27,738,600**	**67.1%**	**7,922,400**	**19.2%**	**5,660,000**	**13.7%**	
Outfall Pipelines Improvements									
Tuolumne River Pipe Crossings	**OP-1**								
Replacement of Existing Crossings	OP-1.1	19,780,000	4,935,700	25.0%	998,300	5.0%	13,846,000	70.0%	100% of Can-Seg Outfall crossing and 20% of Domestic Outfall crossing allocated to Can-Seg. Domestic allocation based on relative PWWF.
Crossing for Third Outfall	OP-1.2	6,265,000	4,168,800	66.5%	843,200	13.5%	1,253,000	20.0%	20% of allocated to Can-Seg. Domestic allocation based on relative PWWF.
Tuolumne River Pipe Crossings Subtotal		**26,045,000**	**9,104,500**	**35.0%**	**1,841,500**	**7.1%**	**15,099,000**	**58.0%**	
Third Outfall Pipeline	**OP-2**	**60,679,000**	**40,376,500**	**66.5%**	**8,166,700**	**13.5%**	**12,135,800**	**20.0%**	**20% of Third Outfall allocated to Can-Seg. Domestic allocation based on relative PWWF.**
Lining of Can-Seg Outfall Pipeline	**OP-3**	**10,456,000**	**-**	**0.0%**	**-**	**0.0%**	**10,456,000**	**100.0%**	
Subtotal - Outfall Pipelines		**97,180,000**	**49,481,000**	**50.9%**	**10,008,200**	**10.3%**	**37,690,800**	**38.8%**	

Table B.2 **Wastewater Treatment CIP Cost Allocation - Customers**
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Domestic Customers				Can-Seg Customers		Comments
			Existing Users		Future Users				
			$	%	$	%	$	%	
Jennings Plant Improvements									
Secondary Treatment/Can Seg Treatment Facilities Upgrades	**JP-1**								
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	40,929,000	6,812,600	16.6%	2,337,600	5.7%	31,778,800	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment. Domestic BOD loading is 31,500 ppd and Can-Seg loading is 109,400 ppd.
Nutrient Feed and pH Control Systems	JP-1.2	2,283,000	-	0.0%	-	0.0%	2,283,000	100.0%	Nutrients for Can-Seg flow.
Peroxide Feed System	JP-1.3	391,000	291,100	74.5%	99,900	25.5%	-	0.0%	Odor control for primary effluent. Allocation based on relative MMF, current MMF is 20.4 mgd and projected future MMF is 27.4 mgd.
Aerators in Recirculation Channel	JP-1.4	8,062,000	1,341,900	16.6%	460,500	5.7%	6,259,600	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment.
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	757,000	126,000	16.6%	43,200	5.7%	587,800	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment.
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal		**52,422,000**	**8,571,600**	**16.4%**	**2,941,200**	**5.6%**	**40,909,200**	**78.0%**	
Primary Treatment and Solids Handling Facilities	**JP-2**								
Primary Treatment Facilities	JP-2.1	15,969,000	11,889,300	74.5%	4,079,700	25.5%	-	0.0%	Allocation based on relative MMF.
Yard Piping and Structures	JP-2.2	13,174,000	9,808,400	74.5%	3,365,600	25.5%	-	0.0%	Allocation based on relative MMF.
Anaerobic Digesters	JP-2.3	40,855,000	30,417,600	74.5%	10,437,400	25.5%	-	0.0%	Allocation based on relative MMF.
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	11,756,000	8,752,600	74.5%	3,003,400	25.5%	-	0.0%	Allocation based on relative MMF.
Sludge Cake Drying Beds	JP-2.5	11,776,000	8,767,500	74.5%	3,008,500	25.5%	-	0.0%	Allocation based on relative MMF.
Primary Treatment and Solids Handling Facilities Subtotal		**93,530,000**	**69,635,400**	**74.5%**	**23,894,600**	**25.5%**	**-**	**0.0%**	
Miscellaneous Repairs	**JP-3**	**873,000**	**145,300**	**16.6%**	**49,900**	**5.7%**	**677,800**	**77.6%**	**Can-Seg and domestic allocation based on BOD loading to secondary treatment.**
Subtotal - Jennings Plant		**146,825,000**	**78,352,300**	**53.4%**	**26,885,700**	**18.3%**	**41,587,000**	**28.3%**	
Engineering Studies									
Master Plan Updates	**ES-1**	**2,000,000**	**1,089,500**	**54.5%**	**314,500**	**15.7%**	**596,000**	**29.8%**	**Allocation based on overall allocation percentages for total CIP.**
Land Application Study	**ES-2**	**250,000**	**-**	**0.0%**	**-**	**0.0%**	**250,000**	**100.0%**	**Study to determine BOD loading for land application of Can-Seg flows.**
Subtotal - Engineering Studies		**2,250,000**	**1,089,500**	**48.4%**	**314,500**	**14.0%**	**846,000**	**37.6%**	
Total		**287,576,000**	**156,661,400**	**54.5%**	**45,130,800**	**15.7%**	**85,783,800**	**29.8%**	

Notes:
(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.

Table B.3 **Wastewater Treatment CIP Cost Allocation - Billable Constituents**
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Cost Allocation						Comments
			Flow		BOD		TSS		
			$	%	$	%	$	%	
Sutter Plant Improvements									
Influent Screw Pump Addition	**SP-1**	**2,198,000**	**2,198,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	**Design criteria based on flow.**
Headworks, Dryden Box, and Influent Flume Improvements Project	**SP-2**								
New Dryden Box	SP-2.1	2,600,000	2,600,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
New West Junction Structure	SP-2.2	300,000	300,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Influent Screening	SP-2.2	4,075,000	4,075,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Grit Removal	SP-2.3	1,469,000	1,469,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Headworks Building Odor Control Improvements	SP-2.4	3,009,000	3,009,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Influent Parshall Flumes	SP-2.5	336,000	336,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Pumping Plant No. 3	SP-2.6	3,060,000	3,060,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal		**14,849,000**	**14,849,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	
Outfall Pump Station Replacement	**SP-3**	**17,332,000**	**17,332,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	**Design criteria based on flow.**
Demolition of Sutter Treatment Facilities	**SP-4**	**4,942,000**	**1,680,300**	**34.0%**	**1,630,900**	**33.0%**	**1,630,900**	**33.0%**	**This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.**
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	**SP-5**	**2,000,000**	**680,000**	**34.0%**	**660,000**	**33.0%**	**660,000**	**33.0%**	**This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.**
Subtotal - Sutter Plant		**41,321,000**	**36,739,300**	**88.9%**	**2,290,900**	**5.5%**	**2,290,900**	**5.5%**	
Outfall Pipelines Improvements									
Tuolumne River Pipe Crossings	**OP-1**								
Replacement of Existing Crossings	OP-1.1	19,780,000	19,780,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Crossing for Third Outfall	OP-1.2	6,265,000	6,265,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Tuolumne River Pipe Crossings Subtotal		**26,045,000**	**26,045,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	
Third Outfall Pipeline	**OP-2**	**60,679,000**	**60,679,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	**Design criteria based on flow.**
Lining of Can-Seg Outfall Pipeline	**OP-3**	**10,456,000**	**10,456,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	**Design criteria based on flow.**
Subtotal - Outfall Pipelines		**97,180,000**	**97,180,000**	**100.0%**	**-**	**0.0%**	**-**	**0.0%**	

Table B.3 **Wastewater Treatment CIP Cost Allocation - Billable Constituents**
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost ($)[1]	Cost Allocation						Comments
			Flow		BOD		TSS		
			$	%	$	%	$	%	
Jennings Plant Improvements									
Secondary Treatment/Can Seg Treatment Facilities Upgrades	**JP-1**								
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	40,929,000	20,464,500	50.0%	20,464,500	50.0%	-	0.0%	Design criteria for the FFR Pump Station are based exclusively on flow. Design criteria for the FFRs are based on BOD. Allocation of cost is split equally between flow and BOD.
Nutrient Feed and pH Control Systems	JP-1.2	2,283,000	913,200	40.0%	684,900	30.0%	684,900	30.0%	The nutrients and pH control are required for proper secondary treatment performance.
Peroxide Feed System	JP-1.3	391,000	391,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Aerators in Recirculation Channel	JP-1.4	8,062,000	-	0.0%	8,062,000	100.0%	-	0.0%	Design criteria based on BOD.
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	757,000	-	0.0%	-	0.0%	757,000	100.0%	Design criteria based on flow.
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal		**52,422,000**	**21,768,700**	**41.5%**	**29,211,400**	**55.7%**	**1,441,900**	**2.8%**	
Primary Treatment and Solids Handling Facilities	**JP-2**								
Primary Treatment Facilities	JP-2.1	15,969,000	11,178,300	70.0%	1,596,900	10.0%	3,193,800	20.0%	Design criteria based on flow. Primary treatment also removes TSS and BOD.
Yard Piping and Structures	JP-2.2	13,174,000	13,174,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Anaerobic Digesters	JP-2.3	40,855,000	-	0.0%	12,256,500	30.0%	28,598,500	70.0%	Approximately 70 percent of the total sludge sent to the digesters will be primary sludge, which corresponds to TSS removal during primary treatment. The WAS consists of solids from BOD generated biomass.
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	11,756,000	-	0.0%	3,526,800	30.0%	8,229,200	70.0%	Allocation based on same basis as anaerobic digesters.
Sludge Cake Drying Beds	JP-2.5	11,776,000	-	0.0%	3,532,800	30.0%	8,243,200	70.0%	Allocation based on same basis as anaerobic digesters.
Primary Treatment and Solids Handling Facilities Subtotal		**93,530,000**	**24,352,300**	**26.0%**	**20,913,000**	**22.4%**	**48,264,700**	**51.6%**	
Miscellaneous Repairs	**JP-3**	**873,000**	**296,800**	**34.0%**	**288,100**	**33.0%**	**288,100**	**33.0%**	**This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.**
Subtotal - Jennings Plant		**146,825,000**	**46,417,800**	**31.6%**	**50,412,500**	**34.3%**	**49,994,700**	**34.1%**	
Engineering Studies									
Master Plan Updates	**ES-1**	**2,000,000**	**680,000**	**34.0%**	**660,000**	**33.0%**	**660,000**	**33.0%**	**Costs are allocated equally to all three billable constituents.**
Land Application Study	**ES-2**	**250,000**	**-**	**0.0%**	**250,000**	**100.0%**	**-**	**0.0%**	**The study will determine BOD loading rates for the ranch land.**
Subtotal - Engineering Studies		**2,250,000**	**680,000**	**30.2%**	**910,000**	**40.4%**	**660,000**	**29.3%**	
Total		**287,576,000**	**181,017,100**	**62.9%**	**53,613,400**	**18.6%**	**52,945,600**	**18.4%**	

Notes:
(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.